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AUTHOR	Sussman, Art
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ABSTRACT

This document contains the cumulative report of the WestEd Eisenhower Regional Consortium for Science and Mathematics Education (WERC) for the fiscal years 1996-2000. WERC regional and national activities involve collaborations with other Eisenhower regional consortia and the Eisenhower National Clearinghouse (ENC). The WERC region includes four states--Arizona, California, Nevada, and Utah--and WERC has served as the Eisenhower Regional Consortium for the Far West Region for the last eight years. Contents include: (1) National Activities with the Eisenhower Network; (2) WERC's Role in Each of Our Four States; (3) National and Regional Development Activities; (4) Lessons Learned about Professional Development; (5) Evaluation Methodology and Findings; and (6) WERC Performance vs. the Indicators. (YDS)

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WestEd Eisenhower Regional Consortium for Science and Mathematics Education Cumulative Report for FY96-00

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In the five-year project period, the WestEd Eisenhower Regional Consortium for Science and Mathematics Education (WERC) made significant progress in fostering the improvement of science and mathematics education in each of the four states of our region (Arizona, California, Nevada, and Utah). During that time, WERC also engaged in initiatives that have a four-state regional and/or national focus. Many of these regional/national activities involved collaborations with the nine other Eisenhower Regional Consortia and the Eisenhower National Clearinghouse (ENC).

WERC has served as the Eisenhower Regional Consortium for the Far West region for more than eight years. During that time, we established successful working relationships with key players and stakeholders in mathematics and science education in our four states and nationally. We also developed and implemented products, processes and resources that assist educators in identifying, implementing, assessing and adapting mathematics and science educational materials including instructional materials, teaching methods and assessment tools.

WestEd's Board of Directors served as the WERC governing board. Since the Consortium's inception in 1992, we have reported to the Board for consultation, advice and approval for our work. The Board meets quarterly and was provided, throughout WERC's project period, with quarterly written reports as well as personal presentations by the Consortium Director and/or staff. The Board Program Committee has exercised primary oversight responsibility and recommends action to the entire Board. During the five-year funding period, the Board reviewed WERC each quarter and annually approved its program of activities.

WERC augmented the funding from the United States Department of Education with cost-sharing and in-kind matching from a variety of sources. In the past three years, the largest single

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sources of documented cost-sharing came via the San Diego Science Alliance (for networking, collaboration and information dissemination in the San Diego area), the Utah State Office of Education (for professional development), and the Stuart Foundation (for development of Elementary Science Cases and associated professional development).

The totals for this report's five year grant period are indicated in the Table below.

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
COST-SHARE	$430,951	$601,111	$762,951	$554,322	$587,750

Success in improving mathematics and science education requires a systemic approach (i.e., aligning standards, policies, and actions; empowering local stakeholders as change agents; addressing key issues simultaneously) rather than piecemeal efforts. Our fundamental strategy has been to provide technical assistance at the state and local levels and to collaborate with a wide variety of partners who also:

- Subscribe to a systemic approach to reform in mathematics and/or science education;
- Involve a variety of stakeholders in the process;
- Attend to under-served student populations; and
- Commit to long-term efforts.

By providing students and teachers with opportunities to access exemplary resources, engage in learning as an active, relevant and empowering process, and participate in communities of learning and growth, WERC has supported the development of an educational system that truly prepares all students to lead satisfying lives and make meaningful contributions in the 21st century.

National Activities with the Eisenhower Network

At the beginning of their joint inception, the Eisenhower Regional Consortia and the Eisenhower National Clearinghouse partnered to form a national, field-based infrastructure to support systemic reform in mathematics and science education. During this five-year funding

period, the project directors within this National Network of Eisenhower Regional Consortia and Clearinghouse (a.k.a. "the Network") met quarterly and maintained continuous electronic communication. In addition, we utilized a committee and task force structure that enabled us to reach and implement decisions, with the ENC Director and one of the Consortium Directors serving as co-chairs of the Network. Many of WERC's national and regional activities were administered in conjunction with this national network. The examples below include activities where WERC either played a leadership role, participated as equal partners, or benefited from the leadership and extra resources provided by another Consortium and/or the ENC.

Eisenhower Math/Science Consortia and Clearinghouse: TIMSS

In 1998, WERC participated in dissemination for the TIMSS National Teleconference—planned and sponsored by the Eisenhower National Network—at 18 downlink sites in our region's four states, and distributed TIMSS Resource Kits throughout the region. In addition, WERC hosted a full-day TIMSS workshops for K-12 teachers, administrators, and business partners at two sites in Nevada and Utah. Workshop evaluations revealed that this experience not only raised participants' awareness of the TIMSS findings, but also increased educators' willingness to re-examine curriculum and classroom practice in light of these findings and share the implications of TIMSS with their colleagues. In all, WERC distributed over 70 TIMSS Resource Kits throughout its region. According to the data collected through a 1998 consortium client survey, recipients of these kits found them to be a useful resource, particularly for professional development activities and to facilitate the process of change. For example, in response to a 1998 client survey, one client commented, "The TIMSS Resource Kit helped me to present information to our school board regarding our curriculum. They helped me to convince the board to adopt curriculum materials that were not on the state-adopted list."

Eisenhower Math/Science Consortia and Clearinghouse:

National Expert Panel on Exemplary and Promising Practices

During the funding period, the Consortia worked to support the National Education Dissemination System (NEDS) as a key component of our identification and dissemination of exemplary and promising programs. WERC Co-Director Dr. Steve Schneider represented the Eisenhower National Network on the U.S. Department of Education Expert Panel on Mathematics and Science Education. While serving as a member of the Expert Panel, he provided technical assistance to panel subcommittees in the process of establishing and finalizing a process of review and criteria for identifying programs as exemplary or promising. He also served on the subcommittee that developed and finalized the science and math training materials as well as the reviewer training methodology. Training workshops were planned, coordinated, and/or and facilitated in part by WERC staff members Dr. Tania Madfes, Ms. Libby Rognier, and Dr. Schneider. Materials developed for these workshops were subsequently used to enable math and science program reviewers to apply the criteria to submitted mathematics and science programs. The three-day workshops provided an overview of the review process and of the seven criteria. In order to establish rater reliability and consistency, the workshops included small-group working sessions to discuss and practice using the indicators under each criteria.

Equity Issues

Since the beginning of the project period, WERC has collaborated with other Eisenhower Network organizations in a variety of activities designed to address issues of equity in education. In keeping with the concerns of the Consortia Directors to address issues of equity through networking with other national groups, former WERC staff member Dr. Sharon Nelson-Barber served as a member of the Eisenhower National Network's Equity Task Force. In this role, she helped to develop a long-term national plan for the Network to collaboratively address equity issues, to revise the Laboratory Network Program (LNP) Alternative Assessment Toolkit, and to disseminate instructional strategies to teach and assess in culturally relevant ways. The Task Force accomplished this latter goal, in part, by

developing and distributing nationally two CD-ROMs: *Equity Resource Guide* and *Making Schools Work for Every Child.*

As part of her collaborative work, Dr. Nelson-Barber conducted research into the culture-based teaching practices of indigenous educators in the Pacific region; this research was disseminated across contexts in WERC's four-state region as well as nationally and internationally. In connection with her case study report, *Teaching Mathematics and Science in Micronesia,* Dr. Nelson-Barber helped design and participate in a three-day language, culture and assessment institute held in Saipan, Commonwealth of Northern Mariana Islands, which was attended by over 200 educators. There, in collaboration with PREL staff, she conducted interviews with indigenous teachers, and later used this data to develop activities that would be adapted for use with the LNP Alternative Assessment Toolkit.

In 1999-2000, WERC staff member Ms. Ann Muench collaborated in planning a number of training institutes for the LNP Toolkit, held for California educators as well as for participants in the Appalachia Rural Systemic Initiative (RSI). In California, Ms. Muench collaborated with district personnel and colleagues from WestEd's Assessment Services Program to present many of the Toolkit's hands-on activities in two separate three-day institutes (one for an urban district, one for several rural districts). Each institute was designed as a training-of-trainers and focused on improving classroom assessment in all disciplines, with special emphasis on diverse learners. There were approximately 60 participants at the training for urban educators and about 35 at the rural districts' training. In addition, the rural institute included a half-day introduction to the *Learning from Assessment* materials (see "National Mathematics Initiative," next section). At the request of WERC's Northern Arizona University staff members, Ms. Muench collaborated with Appalachia Education Laboratory (AEL) staff member Jane Hange to conduct a similar three-day training, presenting LNP Toolkit activities in math and science to 150 teachers and teacher leaders in a seven-state region for the Appalachia RSI. Dr. Hange then provided follow-up for participants as part of AEL's commitment to this systemic initiative.

In our own region, WERC has engaged in several technical assistance and collaboration activities that focus on equity in education. As part of WERC's ongoing collaboration with Northern Arizona

University (NAU), WERC staff member Dr. Jerome Shaw provided a workshop in July 1999 titled "Equity in Science Education: Meanings, Tools, Action." This workshop was offered as part of the NAU Science and Mathematics Learning Center's "Learning to Lead in Science Education" summer institute. Dr. Shaw's workshop engaged over 20 lead teachers, administrators, and reform project staff from various Arizona educational institutions in equity-focused activities from the Systemic Change Toolkit. Selected excerpts from the *Making Schools Work for Every Child* CD-ROM were also shared during the workshop.

Other equity-focused work supported by WERC includes technical assistance to projects serving traditionally underserved student populations such as the UCAN, Navajo Nation, and Arizona Rural Systemic Initiatives (described later in this report). In a similar vein, Dr. Shaw's Science for Linguistic Inclusion Project (also described later in the report) has focused on enhancing teachers' ability to provide high-quality science education to students from non-English-speaking backgrounds.

National Mathematics Initiative – Learning from Assessment: Tools for Examining Assessment Through Standards

In 1998, the U.S. Department of Education established a contract with WERC to obtain technical assistance with respect to the national mathematics initiative. In this role, WERC staff members Dr. Tania Madfes, Ms. Ann Muench, and Ms. Libby Rognier took on the task of creating professional development materials to help teachers use mathematics assessment as a learning tool. The resulting project, called Learning from Assessment, has since become a bridge between standards and the classroom, while offering opportunities for teachers to examine the inter–relationships between assessment, standards, and instruction in order to improve student achievement in mathematics.

In 1999, after field-testing the materials with a wide variety of audiences, the project collaborated with NCTM to publish *Learning from Assessment: Tools for Examining Assessment through Standards*, a complete set of materials to be used in professional development sessions with teachers, along with a website with downloadable resources. A copy is included as Appendix

A. (While *Learning from Assessment* was being developed, the website provided detailed information about the materials, and was linked to websites at WestEd, other regional consortia, and the U.S. Department of Education. During FY00, this website tallied 4,085 user sessions.)

Learning from Assessment (LfA) has been designed for district–level professional developers and teacher leaders who work with middle school teachers of mathematics. Teachers can learn to use the LfA tools in a short period of time. In turn, they can apply the approach to local standards as they design and select better assessment items and plan instruction aligned with standards.

Approximately 2500 sets of LfA materials have been sold and are being used by those who conduct professional development activities with teachers. Our estimate is that approximately 75,000 teachers and other educators have participated in sessions using LfA materials. The project presented workshops based on these materials at each of the U.S. Department of Education's Improving America's Schools Conferences in 1998. In Summer 1999, 36 representatives from the ten Eisenhower Regional Consortia gathered in Berkeley, California for a three-day LfA training-of-trainers institute organized and conducted by WERC staff. Participants in this event then conducted workshops with teachers and other educators in their own regions using the LfA materials. Also during Summer 1999, project staff conducted a two-day workshop in Washington, D.C. for OERI staff and state-level mathematics supervisors. In Spring 2000, staff conducted another LfA training-of-trainers institute for 36 mathematics leaders in California followed by a one-day follow-up in the fall. During these sessions, participants engaged in processes that they could adopt or adapt based on their district and county needs. For example, the math coordinator from Mt. Diablo Unified School District—near Oakland, California—used the materials in a training session for 600 teachers to align assessments with standards.

One assumption used in creating the Learning from Assessment materials is that teachers need to engage in serious discussions with colleagues that help them reach shared interpretations of the standards as applied to instruction. In *Learning from Assessment,* a collection of eighth-grade assessment items from TIMSS and NAEP serve as focal points prompting educators to discuss critical issues that support student learning, such as the meaning of local standards and how to

implement them, articulation in the mathematics curriculum, and standards-aligned assessments. These discussions also serve as prompts for enriching the mathematical content knowledge of the participants.

Feedback from those who are implementing LfA tools in their own work has included comments such as:

> LfA provides structure for assisting teachers as they take a critical in-depth look at standards, assessment, and teaching practices.
> *—District mathematics specialist*

> These materials provide a powerful reason for delving into the standards. They also lend themselves to use for purposes of articulation across grade levels.
> *—County mathematics specialist*

> Two strengths of *Learning from Assessment* are its timeliness and adaptability. Most states are in the process of aligning science and mathematics curriculum to new state standards and *LfA* is extremely helpful in that process. Although the original materials focus on middle school mathematics, the entire package is adaptable to other content areas and different grade levels. Therefore, *Learning from Assessment* is an extremely useful tool for schools and districts. In addition it is an extremely high-quality product. The format makes it one of the best professional development packages with which I have ever worked.
> *—Professional developer, Science and Mathematics Consortium for Northwest Schools*

Participant feedback from pilot and field-test sessions indicated that the LfA materials supply a missing link in building a coherent system of mathematics instruction (i.e., alignment of standards, instruction, and assessment). Observation and feedback also confirm that the materials, combined with the process of inquiry, open up substantive discussions of mathematics among teachers.

Comprehensive sets of materials to be used with teachers are contained within three modules: *Aligning Assessment to Standards, Collecting Standards–based Evidence,* and *Planning Instruction to Support Standards.* Each module has a unique focus and incorporates a variety of techniques that can be adapted for classroom use. Each module also features an assessment item, or group of items, representing geometric and/or algebraic thinking. Both the content and the format of the sessions are designed to result in enhanced learning experiences for students.

Because the materials provide tools for helping teachers align their assessment and instruction with standards, they have been adapted for use in other arenas. In Nevada, Ms. Libby Rognier used the materials to help science teachers and supervisors develop state science assessments, using LfA activities to train writers in identifying the characteristics of a quality assessment item.

Ms. Rognier has also presented LfA workshops at the statewide Mathematics and Science Leadership Institutes in Nevada, and also used the materials extensively with Clark County (Las Vegas area) science leaders in planning and implementing their science professional development program for 2000-2001. LfA's Module 1: *Aligning Assessment to Standards* was the focus of the workshops for Nevada teacher-leaders, who then used the supplemental LfA activities to examine resources to support alignment and create an action plan for district-wide, standards-based professional development in secondary science.

In Arizona, Ms. Muench used the materials to assist several school districts in the development of an articulated, standards-based curriculum. Processes from *Learning from Assessment* were adapted for a series of professional development work with middle school mathematics teachers (grades 6–8) in three districts in the Phoenix, Arizona area. Using the Arizona academic content standards and district assessments for their recently implemented mathematics curriculum, teachers spent five days during their March 2000 intersession, working with Ms. Muench to align their assessment tasks with state standards. As a result, many tasks were adapted or deleted. Also, teachers discovered important "gaps" in their curriculum and began the process of working with the curriculum committee to propose that new instructional units be adopted in the coming year. During a subsequent week of work in June 2000, teachers continued their assessment work by reviewing feedback from their own "field testing" of adapted tasks and wrote rubrics for the new set. The experience was so powerful that district staff decided to offer the same workshops later in the fall for their grades 4 and 5 teachers, who were also implementing a new, reformed curriculum.

Cross–Consortia Collaborations: *Blueprints* and the RSvP Network

Spring 2000 marked the release of the CD–ROM *Blueprints: A Practical Toolkit for Designing and Facilitating Professional Development* , a resource developed by a cross-consortia/clearinghouse task force led by NCREL. Since the beginning of its development in 1996, WERC staff member Ms. Ann Muench has played an integral role as the design lead, writer, and coordinator for the "assessment domain" of this toolkit. *Blueprints* is designed to help

experienced as well as aspiring facilitators learn how to create effective professional development programs for mathematics and science educators. As they explore the CD–ROM, facilitators may use and adapt over 80 activities designed to assist groups of mathematics and science professionals in learning about four content areas: Planning Professional Development, Crafting Curriculum, Refining Instructional Practice, and Making Assessment Decisions. The activities model the use of approximately 22 interactive group processes that, together with the content and a template for creating a professional development plan, serve as a computer-based toolkit for facilitators.

Clients and colleagues have expressed enthusiasm and satisfaction with the design and utility of the *Blueprints* materials. The lessons learned from this and other co-development processes have helped inform further cross–consortia efforts, such as the Middle School Mathematics Initiative.

As a direct result of her involvement in the *Blueprints* CD–ROM team, Ms. Muench was encouraged by the Associate Executive Director of the National Staff Development Council (NSDC) to create a new Network affiliate of staff developers from federally–funded Regional Service Providers, including the Eisenhower Regional Consortia and the Eisenhower National Clearinghouse, Regional Educational Laboratories, Comprehensive Assistance Centers, and Regional Technology in Education Consortia. At the NSDC national conference in December 1997, Ms. Muench joined staff from NCREL and PREL in convening a session that was attended by service providers representing many of these programs. In the summer of 1998, Ms. Muench attended NSDC's Leadership Institute and officially established "RSvP" (Regional Service Providers) as an NSDC network. This group has continued to convene meetings at the annual NSDC conference and maintain collaborative efforts throughout the years. Such cross–program and cross–region collaborations support WERC's goal of coordinating with the other Eisenhower Regional Consortia. They also support intralab efforts to support members nationally in keeping up-to-date with colleagues and leveraging services to fulfill mutual needs in the field. This network has the potential for making and strengthening connections within the Eisenhower Regional Consortia, across projects at WestEd, and across the region and nationally with other institutions and programs.

Middle School Mathematics Project

The Middle School Mathematics Project (MSMP) was designed in 1999 by the network of Eisenhower Consortia as a research study to explore the feasibility of assisting middle school mathematics programs throughout the nation by creating and implementing effective professional development strategies at the local school level. As preliminary steps in the study, three pilot sites were identified for the study in WERC's region: two sites in rural Arizona and one in urban California. WERC staff member Ms. Ann Muench engaged mathematics staff from those sites in research activities during the 1999-2000 academic year. These activities focused on the identification of needs, observation of classes, and the creation of baseline data reports. As part of the Middle School Mathematics Professional Development Network Task Force, WERC staff also helped to identify professional development resources, develop a site report protocol, and plan a session at the NCTM conference for intensive sites.

During Summer 2000, the two participating Arizona sites experienced drastic changes in administration (both principals and one superintendent left their positions); staff (one of the two middle school teachers left his position and was not replaced with a math teacher, and the other teacher was, therefore, no longer as interested in participating in the project); and facilities (a new building for grades 7-12 was completed in a shared location with the K-6 school, which also had a new principal, thus there was an overwhelming amount of change imposed upon the classes). The new administrators (for grades K–6 and grades 7–12) were, nonetheless, receptive to participating in the MSMP, and WERC staff conducted several site visits with their faculty and administration to discuss the possibilities of providing technical assistance and professional development services geared to their situation. However, some of the teachers (grades 6, and 9-12) were reluctant to participate in the data collection activities and felt that our services would not be coming at an ideal point in time, since the school was in search of a new middle school math teacher (the grades 7–8 teacher was a retired social studies teacher, on temporary assignment). The decision was made for WERC staff to return to the campus in Spring 2001 or the following year, once the district had secured its staff and became better accustomed to its new school situation.

During this same time period, the third site (California) requested assistance in collecting and interpreting its data from standardized tests (SAT-9 and California State Test) as well as district performance assessments and grades. This site had recently moved to block scheduling, and teachers wanted to focus their professional development on creating valuable 90–minute lessons and gathering data as to how this would impact students. In addition, due to declining enrollment, this school is in the process of being combined with another district middle school that is not on block scheduling and has selected different curricula. The teachers, principal, and district math liaison are concerned about this transition and would like assistance in working with both sites to share lessons learned and keep communication at a high level.

The main lesson learned with respect to this initiative is to try even harder to avoid the all-too-common difficulty in working with low performing schools related to sudden and drastic changes in administration and teaching staff.

WERC Regional Conference

WERC convened a regional conference in January 2000. For the 144 registrants, the conference provided a mix of workshops, informal networking opportunities, and state leadership meetings. Another aim of the conference was to convene key stakeholders in science and math education, thereby facilitating the planning of state-level education reform. Participants included state science and mathematics consultants, leaders of systemic initiatives, district and county coordinators, university professors, regional service providers, informal science educators, state Eisenhower coordinators, project directors, and teacher leaders. Conference topics included current practices in mathematics and science education, curriculum and assessment issues, integration of technology for science and mathematics instruction as well as current research issues (Appendix B provides a list of participants and conference topics).

The 2000 conference included three pre-conference "Conversations," opportunities for small groups to interact with Eugenie Scott, Director of the National Center for Science Education, Liping Ma, author of *Knowing and Teaching Elementary Mathematics: Teacher's Understanding of*

Fundamental Mathematics in China and the United States, and Milton Chen, Executive Director of the George Lucas Educational Foundation. Another highlight of this conference was the opportunity for participants to preview several mathematics "dynamic manipulation" software programs in the developmental stage, and provide feedback to developers. Multiple opportunities were also included for both formal and informal networking and sharing by participants. The registration for this conference was carried out completely online through our EdGateway conference planning system.

In their feedback about the conference, participants especially appreciated the breadth of workshops offered, and the fact that all sessions were small/intimate enough to allow substantive and personal participation by all attendees. Many participants reported that the contacts and networking were the most valuable part of the conference for them. Several remarked that *every* session they attended was useful and informative (a rarity for conferences), and that they appreciated being connected through a virtual community on EdGateway. As a follow-up, a summary of many sessions was provided via EdGateway, so that information about them could still benefit those educators who could not attend.

The WERC conferences effectively increased clients' awareness of resources and technologies, while also facilitating networking and collaboration among stakeholders.

For example, during a Fall 2000 client interview, one conference participant commented:

> [I've become more] personally aware of what was possible with regards to technology....the first consortium conference that I came to, down in San Francisco, I was very impressed with the technology and the help that [WERC was] willing to do for districts and for states and for individual teachers, to bring us on board more with the technology that was available at that time. So...that was the thing that hit me most of all, was the technology, the connections, a lot of things we didn't have at that time...it kind-of gave me a vision of what was possible.
> *—Science Coordinator, Public School District, Utah*

In another interview, a client described how the WERC conference gave state-level educational leaders the opportunity to meet and collaboratively plan professional development for teachers.

> Over the past three years, WestEd has held three conferences there in San Francisco. And at the conferences, they not only brought together individuals from other states, but they put teams together from Utah. And they asked me who should play on these teams, and they collaborated with me, and we identified the people within the State of Utah--district science coordinators, curriculum directors in key districts, university people--and we put together a team from Utah to come and look at things such as the National Science Education Standards, look at the TIMSS report, look at performance assessments being developed, and put together professional development for my leaders. So, it's really a leadership sort of thing that has occurred there. That was very, very good. And while we were there, they provided time for us to sit down as a state and talk about things.
> It was a nice collaboration.
> *—-Science Coordinator, State Department of Education*

ENC Demonstration Site and Access Centers

Each Eisenhower Regional Consortium has established one Eisenhower National Clearinghouse Demonstration Site in its region, where teachers and the general public can experience the electronic resources available through the ENC. For WERC, this ENC Demonstration Site is located in the California Academy of Sciences in San Francisco's Golden Gate Park. Recognizing the need for more locations where people can receive assistance in learning about ENC, accessing ENC on-line and obtaining ENC print materials, the Consortia and ENC agreed to help set up and support additional ENC Access Centers.

During the funding period, WERC established six ENC Access Centers in Arizona and California which are located at county offices of education, a university, and science museums/centers. WERC has also hosted training sessions for Access Center staff to acquaint them with ENC resources. The centers have served K-12 educators and student teachers—for example, in WERC's third fiscal year, the center at Northern Arizona University estimated serving 200-250 educators per quarter. The resources of the access centers were also used, albeit to a lesser degree, by informal science centers, K-12 students, librarians, and home-school parents. In 1998, Access Center staff changes and a facility relocation interrupted services to some extent. Overall, the Access Center directors have reported informally that the ENC materials were very well received, and were a welcome addition to their educational resources.

In addition to the demo site and access centers, WERC distributed ENC materials (including newsletters, CD-ROMS, and other publications) on a regular basis through direct mailings to individuals, schools, and organizations in our four-state region and nationwide.

Electronic Dissemination Activities

WERC Web Site: During the funding period, the Consortium developed and has since maintained a website—www.wested.org/werc—designed to showcase some of our work while providing information about, and links to, math and science activities in each of our four states. Usage of the WERC web site grew steadily over the project period. During our fifth fiscal year, we tabulated

23,590 user sessions for the site, more than double the figure from the previous twelve months. The WERC website content shifted in the past year, from static information pages to more current announcements and links to state science and mathematics initiatives and resources (such as the *Guide to Selecting and Purchasing Science Materials* developed through a collaboration with the K-12 Alliance, and information and application forms for our Earth System Science online graduate course offerings). These timely postings were highlighted in EdGateway announcements to various online communities, and possibly generated more repeat visits from clients. The Earth Systems Science lesson plans, linked from the Utah State Office of Education Science page, also continued to be a popular feature of the WERC site.

Data from a 1998 WERC client survey indicated that of the 30 clients who reported receiving information about the WERC web site, 93% used the site, and almost 80% used it two or more times. In addition, 92% of those that used the site found that it contributed to their work. These results were echoed in the findings of a 1999 WERC client survey: of the 12 clients surveyed who had used the site, 89% found that the site contributed to their work.

Informal Science: Since its inception in 1992 and throughout the previous funding period, WERC partnered extensively with informal science centers including the Science Education Academy of the Bay Area (SEABA), the Association of Science-Technology Centers (ASTC), and The Exploratorium. Through a two-year contract awarded by Annenberg/CPB early in the project period, WERC and these partners established the Informal Science Educators' Network and its web-based community, which ultimately evolved into an institutionalized service for the ASTC. The Network effectively connected science educators, both in-person and electronically on the web, with the services and resources offered by 250 informal science organizations, thereby fostering their professional growth and increasing their institutional capacity to support science reform. This goal was accomplished in part by hands-on technology training workshops led by WERC and SEABA, where over 250 informal science educators learned how to use the information superhighway to more effectively work with teachers and schools involved in science and math reform.

In addition, WERC collaborated with the other Consortia to develop an online, searchable, national database of informal science centers titled "Science Adventures" (www.scienceadventures.org). WERC assumed the leadership for this national activity and ongoing maintenance of the database thanks to our experience with SEABA and with online searchable databases and due to Dr. Art Sussman's role as leader of the Eisenhower National Network's Informal Science Center Task Force. The database has grown to contain over 2,300 entries and allows searching by city and state, keyword, type of informal center, or searches within a certain geographical radius by zip code. The web site was promoted at conferences and by links on several other science education web sites, and has also appeared as an ENC "Digital Dozen" site.

In this latest reporting period, Science Adventures logged 22,563 user sessions, averaging 62 per day. The average length of time users spent at the Science Adventures site was 6.5 minutes. A 1998 client survey polled 13 clients who had reported receiving information about the Science Adventures web site. Of those, 83% went on to use the web site, 60% of the users visited the site two or more times, and 90% found that the site contributed to their work. Results from a 1999 survey were similar.

Portable Computer Network: As WERC and others (including the ENC) developed more web-based resources, we felt the need to be able to disseminate information about and increase awareness of these resources through demonstration sessions where participants could directly experience them. Generally, this requires a facility with a networked computer laboratory. Yet, the need to provide this experience often occurs in situations where there are no networked computers (conferences, schools). To meet this need, WERC obtained from a grant from Hewlett-Packard that provided us with a 14-computer "portable network" that can be transported to educators wherever they are located and connected to a portable server that connects to the Internet via a single phone line.

During this project period, the Portable Computer Network was used to disseminate information about WERC's web sites and various resources at many events and conferences

ranging from teacher training institutes and state standards review meetings, to statewide and national environmental education conferences and science teachers association conferences. The network also allowed WERC to demonstrate the power of network computing to schools that have no networks currently in place.

Clients and collaborators have attested to the impact of the Portable Computer Network. After bringing the network to the 1998 Project Learning Tree (PLT) International Coordinators' Conference, Kathy McGlauflin (PLT Executive Director) stated, "The information you provided at the conference was well received and contributed to making the conference useful and enjoyable for the 150 coordinators, facilitators, supporters, teachers, and the Urban Leadership Collaborative members who attended the conference."

WERC's Role in Each of our Four States

As an Eisenhower Regional Consortium, we have provided technical assistance at the state level to promote systemic improvements in mathematics and science education. During our previous project years, we have accomplished this important work in a variety of ways.

Planning of WERC services for each state has combined coordination with the state department of education and with key stakeholders. Rather than impose a new planning committee in each state, we have tended to take advantage of and augment existing state committees. For example, our science work in Utah has been coordinated through the existing State Science Coordinating Committee. In Nevada, to the present time we have worked primarily with the State Department of Education Standards, Curricula and Assessments Team. In California, WERC helped coordinate the California Science Education Advisory Committee.

A major strength of WERC's program has been the range of services that we offer and the corresponding breadth of talented staff people. Over the five-year grant period, these have enabled us to engage substantively with clients in our states and to leverage substantial additional funds. In each state, we have focused on key issues, and we have often been working with the same stakeholders for many years.

Arizona

Arizona is our region's second largest state. Within its 114,000 square miles, it has few urban centers (e.g., Phoenix, Tucson and Flagstaff) and numerous rural hamlets. Arizona's school-age population is approaching the "majority minority" status. Forty percent of its public school students are minorities, including Latinos (27%), Native Americans (7%), African Americans (4%), and Asian Americans (2%). Home to over 20 tribes, Arizona has the densest concentration of Native Americans in our region. Thus, Arizona features a wide array of educational settings with variations in size, language, and culture. There are two ENC Access Centers in Arizona: one at Northern Arizona University and the other at the Arizona Science Center in Phoenix.

In Arizona, WERC has collaborated with a variety of stakeholders to further reform efforts in K-12 mathematics and science education. Key partners such as the state Department of Education, public universities, and organizations for teachers of mathematics and science helped ensure continuous and broad-scale impact for our dissemination efforts. More importantly, WERC efforts in Arizona have focused on the design, implementation and evaluation of professional development programs that promote high quality mathematics and science teaching and learning based on the state standards. During the earlier years of the grant period, much of this work was in the area of helping school teams—composed of teachers, administrators and business/community members—to develop curriculum frameworks aligned with the standards. Later work stressed more classroom-focused activities, such as selecting or developing and implementing standards-based instructional materials and assessments.

Arizona Department of Education: Early in the previous project period, after the Arizona Department of Education (ADE) reformed its state science and math frameworks and statewide assessments, WERC provided technical assistance to help the state implement its reform plan. This work evolved into the Arizona Journey Schools Program, a two-year collaboration that provided professional development activities for K-12 school teams across the state in the areas of effective

mathematics and science education, the change process, and effective professional development. However, after the state elections in 1994 dramatically changed the ADE's willingness to participate in national systemic reform, collaborations between ADE and WestEd gradually came to a halt. In 1996, the delegation of Arizona members on the WestEd Governing Board helped re-establish working relationships, thereby facilitating an increased level of communication and collaboration between ADE and WERC staff.

One area of mutual concern has been high standards for student achievement in mathematics and science. In 1998, the ADE released its Academic Standards and Performance Objectives in Science to join those previously adopted in mathematics. WERC staff took on the task of assisting with the dissemination, understanding, and implementation of these standards by integrating them with professional development activities which were provided to Arizona educators. The goal of this professional development, which continues to be operated under the sole guidance of ADE staff, is to help participants understand what standards-based school practice is and how it benefits students and the work of educators; to help them become advocates for standards-based school practices; and to help them plan for improvement within their school community.

Phoenix Urban Systemic Initiative: Our relationship with the Phoenix USI has responded to USI-identified needs. In previous years, we successfully built the capacity of USI staff to operate a Teacher Action Research program originally designed and facilitated by WERC staff members Ms. Kirsten Daehler and Dr. Jerome Shaw. This effort helped the USI to augment their evaluation plan and increase their accountability to NSF by involving teachers in gathering qualitative and quantitative evidence of the USI's impact. In addition, the Teacher Action Research program helped support the implementation of change in mathematics and science classrooms. In 1996, responding to the USI's interest in using the Internet for professional development, WERC staff member Ms. Mayumi Shinohara arranged a collaboration between WERC, the Phoenix USI, and the Concord Consortium in an NSF-funded project called the International Netcourse Teacher Enhancement Coalition. The project

provided online professional development that improved the capacity of Phoenix middle and high school teachers to foster student inquiry in science and mathematics.

In the 1998-99 academic year, demographic and student achievement data led the USI to place a high priority on addressing the educational needs of their significant English-language-learner (ELL) population—i.e., students from non-English-speaking backgrounds who are developing sufficient proficiency in English to enable them to be successful in mainstream content classes such as mathematics and science. Then-USI Science Specialist Michael Lang invited WERC staff member Dr. Jerome Shaw to present a Science for Linguistic Inclusion (SLI) workshop to USI-affiliated participants and key staff. Held in November 1998, this six-hour workshop oriented participants to the SLI project's two strands—curriculum adaptation and teacher professional development—and generated a high level of interest for further collaboration.

Mesa Systemic Initiative: Conversations at the 1997 WERC Regional Conference sparked a collaboration with the Mesa Systemic Initiative (MSI). As with other systemic initiatives, the MSI was a logical partner for WERC due to its comprehensive approach to mathematics and science education reform; its long-term commitment; its high percentage of students from under-served populations, and the involvement of many collaborating partners. Through this collaboration, Dr. Jerome Shaw provided professional development to MSI junior and senior high school teachers in performance-based assessment in science and provided technical assistance to administrators and school teams to broaden their perspectives of models of effective professional development. As a result, teachers gained knowledge of effective practices with respect to performance assessment as well as skill in aligning assessments to curriculum objectives, which helped them to implement a new science curriculum in 1998-99.

UCAN and Navajo Nation Rural Systemic Initiatives: Starting early in the project period, WERC provided technical assistance to the UCAN Rural Systemic Initiative (RSI), serving largely Hispanic and Native American communities in the states of Utah, Colorado, Arizona and New

Mexico, and to its two Arizona-based coalitions: the Arizona Tribal Coalition and the Navajo Nation Coalition. The sustained participation of WERC staff in the UCAN steering committee helped participants develop a shared understanding of how to effectively enhance UCAN systemic reform efforts. To help achieve this outcome, WERC staff regularly facilitated meetings of the committee and provided training sessions to members focusing on the *Systemic Change Toolkit.*

In 1996 WERC staff helped plan and implement the Second Annual Mathematics and Science Conference for Reservation Schools, which emphasized connections with national standards. This conference was attended by approximately 150 educators serving Native American student populations. It featured many presentations given by WERC staff whose topics ranged from national mathematics and science standards, assessment and language, and culturally responsive pedagogy, to environmental literacy, hands-on science instruction, and WestEd resources.

In the Spring of 1997, WERC helped Arizona educators reach consensus on a two-year technical assistance plan with representatives from both of UCAN's Arizona coalitions; this plan was implemented from 1997-99 with assistance from WERC staff members Dr. Jerome Shaw, Ms. Kirsten Daehler, and Ms. Ann Muench. For the Arizona Tribal Coalition, WERC's technical assistance focused on the Tribal Innovation Program, or TIP, involving 29 school and district teams serving predominantly Native American (non-Navajo) students. This two-year technical assistance plan featured ongoing, capacity-building professional development activities that helped the participating teams to understand and implement standards-based mathematics and science education—using culturally relevant instructional techniques and materials—through the alignment of curriculum, instruction, and assessment. The program's key components included: (a) a series of two-day Regional Institutes; (b) a centrally located four-day Summer Institute; and (c) local follow-up between institutes and symposia. WERC staff (Dr. Jerome Shaw, Ms. Ann Muench and consultant Dr. Laura Laughran) collaborated with WestEd's Phoenix office staff (Dr. Jeanne Miyasaka and Ms. Paula Alexander representing WestEd's Arizona State Alliance Initiative and Southwest Comprehensive Center, respectively) on the design and delivery of TIP technical assistance in cooperation with Arizona Tribal Coalition leader Karen Brighton and her staff.

As the TIP progressed, several notable accomplishments were made and important lessons were learned that influenced the program's design and operation. Based on groundwork laid by Arizona Tribal Coalition staff, we were able to bring together, often for the first time, representatives from various institutions—such as public schools, Bureau of Indian Affairs (BIA) schools, tribal education agencies—to focus on standards-based education for a given student population. Concrete results include, for example, a standards-based K-12 scope and sequence for science and mathematics developed and endorsed by both public and BIA schools on the Tohono O'odham Nation reservation. This is, to our knowledge, the *only* such jointly used document that exists on an American Indian reservation. Its existence is noteworthy also because of the intensive collaborative process—involving both public school and BIA teachers and administrators along with tribal education representatives—through which it was developed.

TIP's remarkable accomplishments with the Tohono O'odham Nation (TON) were in part achievable due to the high degree of overlap in the student population served by the two distinct educational institutions. Students on the reservation commonly transfer back and forth from public to BIA schools, thus generating a genuine desire for cross-system articulation. No less important was the intensity of technical assistance services provided by local WERC consultant Laura Laughran to K-12 teachers and administrators.

Because other TIP clusters that lacked a shared student population and similarly intensive level of contact had not yet experienced the same level of success as the TON cluster, WERC staff later collaborated with Arizona Tribal Coalition staff and TIP team representatives to create a new technical assistance initiative that capitalized on program learnings and was designed to better meet school needs while considering the realities of geographic constraints and human resource limitations. Called the Arizona Tribal Coalition Regional Mentors program, or ARM, this initiative focused on building the capacity of teachers from six narrowly defined Coalition regions (e.g., single tribe or shared student population) to provide intensive, localized technical assistance. An outcome of this initiative was the development of skilled teacher leaders who, in turn, have been able to serve as quality technical assistance providers for Arizona Tribal Coalition schools.

In 1998, the Navajo Nation Coalition of the UCAN-RSI was awarded its own RSI grant from NSF. The resulting Navajo Nation RSI continued to work closely with its original parent organization and to participate in many UCAN-wide activities. WERC technical assistance to the Navajo Nation RSI was primarily via that RSI's involvement in UCAN-wide activities in addition to several strategic planning meetings with RSI staff.

For the UCAN RSI as a whole, WERC staff also contributed to the planning and implementation of four major initiative-wide professional development events. Three of these were Science and Mathematics Leadership Institutes held in Fall 1998, Spring 1999, and Winter 2000. Each institute was attended by over 300 administrators, lead teachers and community/tribal leaders from all five of the UCAN coalitions as well as the former Navajo Nation Coalition (reorganized as the Navajo Nation RSI). Over the course of the three institutes, key topics addressed included: (a) national, state, and BIA education standards; (b) standards-based teaching and learning; (c) strategies for gathering, analyzing, and using data for decision-making; and (d) team building and leadership skills. Participants applied their enhanced knowledge and skills by creating and implementing site-specific Leadership Team Actions Plans, which were developed at the first institute and re-visited and revised at subsequent institutes.

Complementing the three Science and Mathematics Leadership Institutes in 1998-2000, the fourth initiative-wide professional development event was a two-day Science and Mathematics Curriculum and Assessment conference held in Fall 1998. This conference enabled over 200 principals, curriculum/instruction administrators, and math/science specialists working in teams to identify practical, standards-based, culturally-relevant curriculum instruments for mathematics and science.

All four of these initiative-wide events featured workshops and breakout discussions facilitated by WERC staff that examined topics such as models of effective professional development, equity considerations in science and mathematics education, and the adaptation of curriculum to meet the needs of linguistically diverse students. For example, in collaboration with staff from the High Plains Consortium at McREL and SEDL's SCIMAST and in partnership with the UCAN staff, Ms. Muench provided leadership in developing the Teaching and Learning strand for the Winter 2000 Leadership

Institute. As part of this strand, Ms. Muench and colleagues presented a nine–hour *Learning from Assessment* training session for approximately 60 participants from across UCAN's four–state region of Utah, Colorado, Arizona, and New Mexico.

Participants rated these events highly and subsequently requested additional materials and presentations. Comments offered during the Fall 2000 WERC client interviews have confirmed that WERC's technical assistance has had a positive impact in Arizona. For example, a UCAN staff member noted that curriculum alignment has been one of the most important outcomes from WERC's support of the Arizona Tribal Coalition. It showed teachers that there were "tremendous gaps" between what they were teaching and what was considered quality science and math education, which was a "big eye-opener for them." This client also described how the program increased teacher involvement in reform efforts:

> [It] helped coalesce the needed support at the local level to do the alignment process from a team approach, whereas before, any changes in curriculum were often done by the director of instruction, the curriculum leader at the school, with very little or no input from anyone else. So that [alignment effort] really broadened the participation of the teachers and administrators at the school. [It was also] extremely effective in helping to organize a teaching core of people for the Arizona Tribal....and helped to bring other schools in the Arizona Tribal Coalition into more active involvement when they started to see the benefits that the schools that were getting from the training. And in addition, I think that the program helped clarify for the school boards, the tribal boards, what reform was about. And certainly, we have seen improvements in science and math scores over the last couple of years in the Arizona Tribal Coalition.
> *—UCAN staff member*

Students, too, appear to be reacting positively to classroom changes supported by these programs. For example, during a Fall 2000 client interview, a middle school math teacher who participated in the two-year Tribal Innovation Program described how she uses more standards-aligned instruction, including activities and rubrics; relies less on the textbook; and relates the content to more real-life situations. She feels that these changes have made a difference for her students, including those who are at-risk:

> Last year...my 6th graders and my 8th graders did the AIMS test. And the one thing that amazed me, was, prior to that, they've always been concerned about any type of standardized test. [But this time] they weren't afraid. When they started the test, it was like, "Oh, wow! This is easy! I can do this!" And we haven't gotten our scores back yet, but what I looked over, they were not bad. Especially my 8th graders...[they] were very, very engaged in it, and really interested in what their scores were. So for my group, that's an accomplishment! We have full inclusion at our school, for all special ed students, and we have individual education plans for them. But what we have found, since we've implemented the more standards-based and hands-on, I guess outcome-based instruction, they are progressing much more rapidly than with the old style of teaching. We've watched them move up on their scores on their standardized tests, and...every day, I no longer have to tell

them, "OK, well you only have to do the first 15" while everybody else does 30, because they're finding that with the activities, they can participate just as actively as everyone else can.
—Middle School Math Teacher, BIA School, Arizona

Most recently, WERC staff provided technical assistance to the newly formed Arizona Rural Systemic Initiative, which is operating under a one-year development grant awarded by the National Science Foundation in August 2000. The Arizona RSI, an outgrowth of UCAN's Arizona Tribal Coalition, is based at the American Indian Programs department at Arizona State University East and is composed of over 20 school-based leadership teams from rural schools that serve largely Native American (non-Navajo) and Latino student populations mostly in the southern half of the state. As WERC liaison to the Arizona RSI, Dr. Jerome Shaw serves on the initiative's core management team and assists with the design, implementation and evaluation of multiple RSI activities.

A key event during this reporting period was the first in a series of three RSI-wide Strategic Planning meetings held at the end of August 2000. At this one-day meeting, the nearly 100 participants gained a shared understanding of the Arizona RSI's goals and objectives in addition to planning for needs assessment activities to be conducted prior to the second Strategic Planning Meeting scheduled for December 2000. Participants praised Dr. Shaw for his role as lead facilitator for the August Strategic Planning meeting and preliminary feedback indicates that several teams are making progress in identifying their needs with respect to standards-based reform in mathematics and science.

California

California, the largest and most populous state in our region, has nearly 80% of the WestEd region's total student population. As a "majority minority" state, California also stands out as having one of the most diverse student bodies in the nation. The K-12 public school population is approximately 44% Anglo, 36% Latino, 11% Asian American, and 9% African American. California students speak over 100 different languages; those students with limited proficiency in English constitute nearly a quarter of the total school age population. WERC's ENC Demonstration Site is at the California Academy of Sciences, and ENC Access Centers have been hosted at the Technology Resources Center at the Shasta County Office of Education in Redding, the Tech

Museum of Innovation in San Jose, and the Teacher Resource Center at the Los Angeles County Office of Education.

This large and dynamic state has benefited from a rich array of projects and institutions that provide services to improve math and science education. However, for the state as a whole and even within its regions, these efforts have often been fragmented. Therefore, the special focus of WERC efforts in California during this project period was the fostering of local and statewide collaborations to better coordinate the work of mathematics and science education providers.

California Science Education Advisory Committee (CSEAC): California is the only state in our region that received funding from the NSF State Systemic Initiative (SSI). Since the California SSI and WERC both focused on promoting collaborations to assist systemic reform, this became a very fruitful area for collaboration between the two projects. Together, in 1995 we established an "official" science education advisory committee, the California Science Education Advisory Committee (CSEAC), to share information and to work collectively for the continued improvement of science education in California's schools.

CSEAC has a membership of 35-plus organizations from statewide professional development groups, county offices, districts, California Department of Education (CDE), national labs, institutions of higher education, business and industry, and parents. Throughout the project period, WERC undertook primary responsibility for convening CSEAC meetings and developing and managing a related statewide science education listserv.

During 1995-2000, CSEAC achieved the following major accomplishments:

- Assisted the state in the development of science standards. This activity became a major initiative for the Consortium and is described in more detail below as a separate section.
- Initiated the California Systemic Initiatives Assessment Collaborative (CSIAC), a vital component of the state's systemic reform program which has provided spring science assessments in the past four years for California schools involved in NSF systemic reform efforts as well as other districts/programs that want to use multiple assessment measures

aligned with national standards. This assessment continues to be administered in grades 5, 8 and 10 to approximately 20,000 students in California. This project has expanded and received independent funding from the National Science Foundation as a WestEd initiative.

- Established a listserv to share science education information with more than 900 California science educators, most of whom serve as local sources of information, training and resources. This listserv has been particularly important in disseminating time-sensitive information about the California science standards as well as information about professional development opportunities, TIMSS, statewide testing, and legislative/other developments affecting science educators. To date there have been 141 announcements posted and disseminated via this one-to-many electronic information dissemination system.
- Helped to organize and implement a day-long Administrator Day as part of the California Science Teachers Association (CSTA) annual conference. This event features formal recognition and awards for administrators who contribute to the implementation of high-quality science instruction.
- Developed and disseminated a new publication (*A Guide to Selecting and Purchasing Science Instructional Materials*) to assist California school districts (included as Appendix C).

California is an instructional materials adoption state for grades K-8. In other words, state instructional materials monies are tied to a list of materials that have gone through a review process and have been adopted by the California State Board of Education. Districts select from this list to purchase materials for their instructional programs. The standards adopted by the State Board of Education in 1998 now serve as the foundation for science instructional materials submitted for consideration to be adopted by the state. The state board also adopted the evaluation criteria that were used to review the instructional materials. In order to help California science educators to make informed decisions about what materials are right for their students, WERC collaborated with the K-12 Alliance, CSEAC, the California Science Teachers Association, and other regional science associations to develop and publish *A Guide to Selecting & Purchasing Science Instructional Materials*. Rather than recommending

any particular programs, the guide provides information related to the review and selection of instructional materials. It identifies the products that were adopted by the state, maps them against the state content standards, and provides tools for gauging the quality of the materials. It also describes the rules and regulations for purchasing materials.

Regular CSEAC meetings (about 6 per year) and the CSEAC listserv function as the primary communication method for this group. One of the lessons CSEAC has learned involves how to use the listserv to disseminate information relating to a highly charged topic (e.g., science standards in California) without getting in trouble politically and without having the discussion degenerate into a forum for angry, polemical debate. To resolve this dilemma, we therefore established that the CSEAC listserv would focus on providing objective, non-judgmental information via a "one-to-many" email announcement function managed by Dr. Sussman, and that a separate "many-with-many" electronic discussion group would be established on EdGateway. This lesson proved valuable as the CSEAC Announcement listserv became the optimum mechanism for keeping California science educators informed without telling people what to think or suggesting what they should do. In a way, it models constructivist approaches to education by assuming that people will build on their existing knowledge to make sense of the information provided.

WERC frequently receives electronic and personal expressions of gratitude for the CSEAC listserv. We also know that many of the people who receive information through the listserv pass it on to their own group of contacts. The following quotes, offered during the Fall 2000 client interviews, attest to clients' appreciation for this listserv.

> We're on [the CSEAC] listserv, and a lot of people are, so that's good. We meet a lot with teacher leaders, and we try to do planning in our area, and the more informed they are, the better it is. And it's hard to get the word out to them....when we had an event or something that impacted the region, we could send Art a flyer, and he would put it up on [the CSEAC listserv]. And that was very, very helpful. Because that automatically goes to people's computers. And [through the listserv] Art has made it his duty to [distribute] the latest on the standards, and things like that, and it's just nice to go to a [county or district staff] meeting, and [the staff has] read those messages as well.... something like that really, really helps people in more rural areas....
> —*Administrator/Science Project Coordinator, County Office of Education, California*

> Information becomes available and is disseminated almost immediately through [CSEAC], and that can be reports from the State Board, it can be updates about grant opportunities, whatever. It's just an excellent source of getting the information and resources disseminated to a group of people. It's information that's used in your job. [For example, CSEAC] helped us to be coordinated enough to make sure that we were present so that

when the opportunity to provide information [about the development and approval of state standards] was permitted, we then provided the information.

CSEAC has strengthened relationships because it's been ongoing and continuous, where we meet periodically throughout the year, on a regular basis, there is a focus to what it is that we talk about, and when situations come up where anybody from the group needs something and we turn around and ask each other for it, it's received, and whatever was needed is oftentimes provided. [CSEAC provides] the continued support and relationships that allow you to do your job. So you get more information, you find out what other people are doing, you're able to engage in a conversation...find out what's working, and what isn't, and try new things, and then get feedback on it, so it's a really nice, rich dynamic...it makes you a more informed professional so that when you do go back to your site and you do back to work, you know what you're talking about, you've clarified your thinking...it impacts the culture in the way we think.

—Science Project Director, Institution of Higher Education, California

California Science Content and Performance Standards: CSEAC and WERC played a very strong leadership role in representing the California science education reform community throughout the development and adoption of the California Science Standards. In 1996-97, WERC coordinated the development of Draft California Science Content and Performance Standards for the Superintendent's Challenge Initiative. As part of this process, WERC recruited experienced education professionals for membership on the standards committees; convened committee meetings to draft the standards and sample performance tasks; developed new ways to utilize telecommunications and the World Wide Web to support and expedite the standards development, review and dissemination; and hosted a special standards review session for districts and schools participating in the CDE's Challenge Initiative along with a training on how to access and review the standards on the web. These reviews were part of a large statewide effort that included teachers, scientists, university science educators, staff at a variety of informal science organizations, and administrators at many levels.

WERC invested heavily in this standards development for a number of important reasons. The most pressing was the urgent request from the California Department of Education to develop standards for the Superintendent's Challenge Initiative. A second important factor was the need to develop expertise and resources with respect to science standards, which would in turn help districts and counties that were then going through the process of developing and implementing local science standards.

The third factor was directly related to an important statewide development, the legislative creation of the Academic Standards Commission (ASC) to develop standards that would form the basis for new statewide assessments. In 1997, the ASC solicited a contractor to help develop the science standards. The CSEAC/Challenge Science Standards had been generally well received but there was strong criticism from a group, the "Associated Scientists," composed primarily of research scientists at institutions of higher education. Other California and national scientists, however, reviewed the document favorably, including a representative from the National Academy of Sciences who had been requested by Dr. Bruce Alberts, President of the Academy, to judge whether the CSEAC/Challenge document aligned with the content and spirit of the National Science Education Standards. Based on this support, CSEAC encouraged one of its members, Dr. Bonnie Brunkhorst of California State University, San Bernardino, to submit a proposal to lead the standards development effort using the expertise that had already been developed. Dr. Brunkhorst's group included 12 writers, many of them CSEAC members such as Dr. Art Sussman, who advocated for conceptual understanding over detailed vocabulary, interdisciplinary connections, alignment with the national standards in terms of both content and grade-level appropriateness, and connection with student experience and real-world issues rather than a focus on the traditional discipline-specific knowledge.

Initially the Commission selected Dr. Brunkhorst's science education reform group but this decision was successfully challenged by the Associated Scientists, a traditional group which argued that the National Science Education Standards and the *Benchmarks for Science Literacy* of the American Association for the Advancement of Science were based on "bogus research." Despite the fact that the Commission as a whole and its Science Committee tended to agree with the reform-based approach rather than the very traditional approach, this latter group had much more influence. To make matters worse, the traditional approach was advocated by the Chair of the Science Committee (the late Dr. Glen Seaborg), the facilitator for the Science Committee, and the member of the Committee with the most influence on the State Board of Education (SBE). Consequently, the two groups were forced to work together to develop the science standards.

As stated earlier, WERC is closely associated with CSEAC; consequently WERC provided a significant level of input to the ASC standards development and review process. As a member of Dr. Brunkhorst's group, Dr. Sussman helped to write the standards, to negotiate with representatives from the Associated Scientists to find mutually acceptable language, and to provide input to the ASC Science Committee. He consistently brought in advice and expertise from the national scientific and science education communities, which included inviting the President of the National Academy of Sciences and the President of the National Science Teachers Association to testify to the ASC. Other WERC staff and the CSEAC community provided vital support.

Eventually, WERC and CSEAC influenced the ASC to vote that their standards would reflect the grade-level appropriateness of the National Science Education Standards as much as possible. Where they did not match, the Commission debated the particular issue and then had the option of choosing to include material at earlier grade levels than in the national documents (an option that was exercised in several cases, at the insistence of Dr. Seaborg). As a result of these efforts, a set of science standards was approved for the state by the ASC and, in turn, these standards were then adopted with only minor changes by the California SBE in October 1998. As we had hoped, the Board made only very minor changes to the draft that had been submitted to them by the ASC. In that respect, our efforts to achieve compromise at the Commission level had succeeded.

One of the lessons we learned with the development of the standards was that if we insisted on being ideological purists, we would have had no effective input into the process and the state would have ended up with science standards that were much more harmful. Therefore, we adopted a strategy of attempting to make the standards as good (from our point of view) as we could, thereby compromising and recognizing that the final product would inevitably have features that we would regret.

This entire process continually involved learning new lessons and applying them thoughtfully. We learned how to blend our own democratic procedures within CSEAC with the needs to respond rapidly, decisively and coherently as a group. We learned how to express our beliefs and desires in ways that the Associated Scientists could hear and accept. For our part, we also learned ways to

accommodate their beliefs and desires while still using language that minimally violated our own principles.

The final compromise document reflects a number of important "victories" that we won. We succeeded in establishing a prominent and consistent role for investigation and experimentation in the standards. In addition, for each topic in each grade level, we were able to include an introductory sentence that highlights understanding the larger concepts rather than just knowing the isolated facts. We also succeeded in preventing the high school science standards from becoming absurdly technical and far beyond either the skills or the needs of the typical high school student.

Finally, many of us in the science education reform community are very limited in the extent to which we can participate in political processes, considering the nature of our organizations and our level of funding. To compensate for this, we learned how effective and critical it can be to enlist greater involvement from the business and local communities so that they can better understand the issues and advocate more effectively.

Mathematics Professional Development Initiatives: During the project period WERC provided financial support and collaborated with three mathematics professional development projects. These three were selected because they matched WERC's four criteria for collaborations, namely that the projects subscribe to a systemic approach to reform; involve a variety of stakeholders in the process; attend to under-served student populations; and commit to long-term efforts. These projects are described below.

- *Mathematics Renaissance K-12:* A professional development initiative funded by the National Science Foundation, the California Department of Education, educational foundations, and local school districts, Mathematics Renaissance K-12 (MRK-12) collaborated with WERC in 1998-99 to provide professional development experiences to K-12 teachers, thereby enhancing their mathematical knowledge and expanding their ability to make sound instructional decisions.

In 1998 and 1999, with support from WERC, the MRK-12 professional development featured multiple-day summer institutes where over 100 teachers from 20-plus California districts scored student work from an MRK-12 performance assessment administered in grades 4, 8, and 10 in participating districts. There, teachers learned about performance assessment and the point-scoring methods utilized in TIMSS, examined their own scoring experience in relationship to the TIMSS findings, engaged in discussion of mathematics to deepen their mathematical content knowledge, and examined the implications of their professional development experience for their own classroom.

The examination of student work and the consideration of performance issues sparked discussion among teachers as to how they can improve student performance and how to assess what students know and can do across the grade levels. It also provided a focus for further professional development work, as MRK-12 facilitators and regional directors subsequently customized professional development sessions within their districts/regions. As a result, about 850 teachers participated in local/district workshops that focused on scoring and/or analyzing student work from the MRK-12/Mathematics Assessment Resource Service (MARS) assessment.

These statewide and local sessions gave teachers a better understanding of what their students need to do in the future grades, as well as providing them insights into the mathematics experiences students have had in earlier grades. This helped them to focus their work at their own grade level. Institute evaluations revealed that the experience prompted teachers to consider important issues and to integrate what they learned into their classroom practice, as evidenced by the following comments:

- "I realize that I need to step more out of the role of teacher (with the correct answer or correct method) and truly question my students' answers and methods so that they can actually become better critical thinkers."
- "I'm convinced that students need more experiences with writing mathematically to explain their thinking and understanding. It also taught me the importance of modeling different ways of solving problems."
- "When I get back to my classroom...I'm going to work on encouraging kids to explore solutions and stretch their minds and to allow them more time to think about their thinking and to discuss in writing or amongst their peers - like we have accomplished during this scoring session."

- "I have much to do to make my mathematics instruction more applicable to the real world, so that my students will allow themselves to enjoy and really get into this particular subject area."

The MRK-12 Project learned many important lessons. First and foremost, student performance assessments provide an important opportunity for teachers to learn, as shown by the higher level of conversation among teachers resulting from the examination of student work and the consideration of performance issues. Secondly, by revealing that most students could not make mathematical generalizations, the scoring of the assessment confirmed TIMSS data while providing a strong impetus for the 1999 MRK-12 professional development focus on generalization. Finally, the building of district capacity played an important role in helping this project to impact more teachers while making it easier to customize sessions to local needs.

❖ *Bay Area Mathematics Project:* The Bay Area Mathematics Project (BAMP) was established to help educators to upgrade their skills and knowledge and to strengthen the network of mathematics educators working to improve mathematics education in California for all students. BAMP has served the Greater Bay Area education community for over 15 years by promoting improved classroom practices, facilitating increased access of under-represented minorities to rich mathematics programs, and generating and supporting new leadership.

In 1998-99, WERC collaborated with BAMP to provide a week-long middle school mathematics summer institute designed to support improvement in the content and delivery of instruction in the 6th, 7th and 8th grades for teachers and schools in the Greater San Francisco Bay Area. The Institute offered 30 teachers the tools and strategies to reach more students for higher levels of success in mathematics. Utilizing hands-on workshops, mathematical investigations and in-depth discussions, the program provided rich mathematics content, instructional techniques, innovative curriculum, and an increased awareness of issues affecting middle school mathematics. The participants from this institute joined more than 650 teachers from 60 districts in BAMP's network of teacher leaders by participating in the BAMP Summer Institutes. In the spirit of "teachers teaching teachers," BAMP alums have hosted hundreds of workshops at various

mathematics conferences and inservices for teachers statewide and nationally, providing thousands of teachers with successful strategies for the teaching of mathematics.

The following quotes regarding the BAMP program were obtained from a 1998 survey of WERC clients:

- "I believe the Bay Area Math Project Summer Institute is the best workshop I have ever been to. I learned more at BAMP then probably all the other math workshops I have attended combined. Gary Tsuruda is a wonderful teacher, and someone I admire greatly."
- "If your organization contributes to funding for BAMP, know that it's money that is very well spent. I came away from my seminar series with renewed enthusiasm for teaching mathematics, along with many new and stimulating ideas and education strategies."
- "The BAMP middle school math project was the most valuable and professional of any workshop I have attended in 20 years of service in public education. The quality and quantity of information met and exceeded standards of excellence and will serve to guide my curricular and teaching methods for years and years."

❖ *Middle School Mathematics Cases:* The third WERC collaboration to promote California mathematics professional development was with the Mathematics Case Methods Project at WestEd. The Mathematics Case Methods project, a highly successful approach to teacher professional development, has enabled teachers to deepen their insight into their students' mathematics thinking. Teachers involved in the Math Case Methods project discuss and disentangle mathematical meanings underlying the algorithms that are typically taught. A subset of teachers learned to facilitate their own discussions, thereby developing the capacity to continue case discussions on their own.

NSF funding and a partnership with the California Math Matters Project in 1995 enabled the Case Methods Project to focus on the development of teacher-leaders who serve at-risk students and/or are from traditionally underrepresented ethnic groups in the mathematics education community. In 1998-99, funding from WERC helped the Math Case Methods project to extend its outreach in Oakland Unified to include over 25 additional elementary and secondary teachers and math department chairs in 60 hours of case discussion.

Evidence of the project's impact may be seen in the fact that a core of approximately 25 Oakland teachers and teacher leaders committed to continuing their development as case discussion

facilitators, advanced leaders, and disseminators of Math Case Methods. This cadre of teachers also committed to facilitating case discussions with other groups of teachers at their district and school sites. Thus, Math Case Methods is being institionalized into the Oakland Unified School District, both at the elementary and secondary levels.

Project evaluations of the case discussion work accomplished in Oakland Unified were overwhelmingly positive. Of the 23 teachers who participated in the evaluation, 70% rated the Math Case Methods professional development as having the strongest potential for impact on their teaching. When asked what was valuable about the mathematics case methods work, 80% of the teachers articulated many features, such as the opportunity to reflect, to think about student thinking, and to develop their own understanding of mathematics and mathematics teaching. Typical comments from Oakland teachers included the following:

- "[The discussions gave me] an opportunity to reflect and think about my own practice and thinking about mathematics, assessment and the use and value of certain materials in instruction. I found the sessions intellectually stimulating."
- "It was helpful to look at teacher practices. This tool should be used to assist beginning teachers and veteran teachers."
- "In the case discussions, I was able to spend time talking 'math' with other teachers, using this effective method. I reflected on my own problem-solving skills and the need for further development. I listened to and discussed obstacles and solutions for learning math."

One of the lessons learned by the Case Methods Project is that it is important to include key district personnel in the planning and implementation of district-wide professional development activities; their knowledge and buy-in to the project was critical as Oakland Unified was forced to re-negotiate the collaboration with the project due to a lack of substitute teachers.

San Diego Science Alliance: The San Diego Science Alliance (SDSA) is an important regional alliance that has received considerable support from WERC. SDSA was formed in July 1994 when a small group of people who were interested in enhancing science education met to determine what science-related programs were available in San Diego. They were responding to a general perception and concern that San Diego teachers needed assistance in identifying and

accessing local science education programs and resources. In particular, the original founders of SDSA had a high representation of high-tech companies and they were especially interested in expanding teacher access to science education related to technology. Over the years, the participation of dozens of high-tech private-sector companies --including Pacific Bell, TRW Avionics Systems Division, The Salk Institute, and General Atomics, among others--has contributed significantly to the growth of the Alliance, cumulatively adding up to hundreds of thousands of dollars in cost-sharing contributions. Through networking efforts, SDSA has grown to include representatives from over 200 organizations, including the biomedical community, higher education, municipal agencies, museums and other informal science centers.

The primary Alliance activity is the dissemination of information about programs and resources. Each year, SDSA has produced and distributed 3,000 copies of a print Resource Catalog that categorizes programs by 22 focus areas (e.g., Biotechnology, Health, Mathematics, Physics), provides profiles of participating organizations including best-known products or services, and information about summer employment and internships. Using WERC assistance and EdGateway technology, SDSA transitioned to providing the resource and program information in the form of an instantly updatable, searchable on-line database. While this is the best way for teachers and providers to access the information, SDSA has continued to publish an annual hard-copy version for those with very limited access or computer skills.

In the most recent reporting period, technical assistance to SDSA has focused on upgrading the SDSA website (www.sdsa.org). Notably, WERC staff planned and developed an EdGateway-based feature called "Ask a Scientist," which connects San Diego-area scientists with K-12 science teachers in order to answer questions, promote student enthusiasm about scientific professions, and make science instruction current and meaningful. WERC staff members have coordinated and monitored the discussion while routing teacher queries to scientist volunteers with expertise in that content category.

WERC supported the SDSA website by adding other features using EdGateway tools. In addition to the searchable, online version of the Resource Catalog, these features include an

interactive, up-to-date monthly San Diego calendar of science education related events; a discussion group; and an announcement system. These features allow new information to be quickly and easily distributed to educators, students, and business leaders in the SDSA community. SDSA Executive Director Pat Winter can target e-mail announcements to specific constituencies such as middle school teachers or educators interested in physics. Consequently, SDSA can keep over 1,100 San Diego K-12 teachers informed of special opportunities and other time-sensitive information, while also sending messages to all organizations/businesses listed in the Resource Catalog.

WERC clients have found the SDSA website to be effective at enhancing collaboration among stakeholders. For example, a respondent to a 1998 consortium survey commented: "The development of the SDSA web site has greatly enhanced my science education community's ability to communicate about issues and opportunities." In addition, a recent article in *Technological Horizons in Education Journal* (January 1999) stated the following about the SDSA:

> Using the enhanced web site as a springboard, SDSA members will soon be able to form their own interactive education communities, taking professional development into their own hands. This is truly an industry/education success story: a small group of people leveraging a vision, with the determination to join forces and support science literacy in local schools and creating a clearinghouse of science education resource to make science instruction relevant and meaningful.

Since 1998 SDSA has co-sponsored three annual San Diego County Educational Technology Fair in conjunction with all five of the county's Congressional representatives; these are perhaps the only times that such an event has engendered such bipartisan support. The fair was conceived to make science concepts and careers come alive with hands-on interactive exhibits and information from more than 50 of San Diego's leading high-tech businesses. San Diego WERC staff played key roles in the planning and on-site coordination of the fair, which was attended by over 5,000 high school students.

Pat Winter, SDSA Executive Director, described how WERC's assistance has also benefited other programs and projects that were launched by SDSA:

> The San Diego Science Alliance has implemented pivotal activities contributing to the success of the organization that all result or significantly benefit from collaboration with WestEd's Eisenhower Regional Consortium. In addition to our electronic database and print resource catalog, these include the NSF-funded PISCES Project (Partnerships Involving the Scientific Community in Elementary Schools), the BEWiSE program for middle school girls, and our internet-based Ask-A-Scientist project.

Planning and fundraising that was undertaken for the PISCES Project resulted in a generous contribution from Hewlett-Packard and a matching $30,000 anonymous gift. The BE WiSE project (Better Education for Women in Science and Engineering) targets K-12 female students with help from San Diego-area women's scientific professional societies and a grant to fund the effort. This initiative illustrates another example of an effective business/education partnership in San Diego.

WERC's work with SDSA has yielded a successful model of collaboration and technical assistance that can be replicated with other organizations. For example, Project Tomorrow of Orange County, California recently contracted with WERC to develop similar online services for their science teachers, including a shared online resource directory which will refer teachers to educational resources and opportunities in both Orange and San Diego counties. In addition to building the online Project Tomorrow site, WERC staff have facilitated meetings between SDSA and Project Tomorrow to enhance collaboration between these two organizations.

California Math Implementation and Accountability: In 1998, WERC became involved in two initiatives funded by the California Department of Education which focused on mathematics. Dr. Steve Schneider served as the Principal Investigator for both projects.

- *Mathematics Implementation Study:* Through a $500,000 contract with the California Department of Education, WestEd, in partnership with the RAND Corporation and Management Analysis and Planning (MAP), studied the instructional practices used in teaching mathematics. WERC Co-Director Dr. Steve Schneider served as the PI for this study.

  Focusing on mathematics classrooms in grades 4 and 8, the study sought to identify the pedagogies, materials, and professional developments that are associated with higher mathematics achievement; to gauge their prevalence throughout the state; and to assess the influence of state and local policies on instructional practice. The study, which concluded in Spring 2000, collected and analyzed teacher questionnaires, SAT9 scores, classroom observations, and interviews with selected principals and curriculum coordinators. It was successful in establishing a set of baseline data against which future changes in instructional practices and achievement can be measured.

❖ *Evaluation of California's Standards-Based Accountability System:* In order to meet the federal requirements of IASA Title I, which require that state education agencies develop challenging content and performance standards and have annual assessments aligned with those standards, the State of California established a Standards-Based Accountability System in accordance with the IASA State Plan. The system looks primarily at literacy in science and mathematics. Central to this system are data reporting requirements which include a description of districts' assessment and accountability systems and student achievement data (using multiple measures) for all schools according to the local grade-level standards.

To begin an evaluation of California's Standards-Based Accountability System, the California Department of Education awarded a $200,000 yearlong contract to WestEd, in collaboration with Management Analysis and Planning (MAP). From 1998-99, with Dr. Schneider's guidance as project PI, the evaluation examined the processes and impact of the Standards-Based Accountability System in school districts statewide and the relationship of this system to school district efforts to improve student performance. WERC staff members reviewed state accountability documents, district accountability plans, and current state standards; conducted interviews with selected state officials and district staff; and developed and administered a questionnaire to 200 district personnel relating to local accountability plans and practices.

Other California Work

❖ *LASERS:* Dr. Jerome Shaw continued to provide technical assistance to the Language Acquisition in Science Education for Rural Schools (LASERS) project, a National-Science-Foundation-funded local systemic change project based at the University of California, Santa Cruz. A five-year initiative that ended in Spring 2000, the LASERS project focused on increasing the capacity of K-8 teachers to provide high-quality science instruction to linguistically diverse students—the majority of whom are Latino—in a consortium of seven school districts in rural northern California.

In previous periods, Dr. Shaw worked with LASERS staff on the design and implementation of their professional development strand, specifically a three-day science and language workshop

series. He also guided a LASERS curriculum development team in applying the principles of his Science for Linguistic Inclusion (SLI) project to the Life Lab Science curriculum, in order to adapt it for use with English Language Learners. The team successfully produced a sample modified Life Lab unit and supporting tools for use in LASERS professional development settings.

In the most recent reporting period, Dr. Shaw completed a SLI Seminar cycle for LASERS in which 10 LASERS teachers analyzed and adapted several Life Lab units to better integrate science learning and English language development. At the final session, held in February 2000, seminar participants presented the results from teaching their adapted units in their own classrooms. They reported outcomes such as a clearer understanding of a unit's science content and language demands and high levels of student engagement with the revised lessons.

Also during this time frame, Dr. Shaw presented his SLI-based "unit planning" (i.e., curriculum adaptation) process at the California Science Project Leadership conference in April 2000. At this two-day event, teams from all fifteen regional chapters of the then-existing California Science Project (funded by the California Department of Education) became familiar with the process and planned how to incorporate relevant aspects into their own institutes during the summer of 2000. Several CSP project leaders have reported integrating this process into their professional development with positive results.

In a Fall 2000 interview, a LASERS workshop participant described how the experience impacted her teaching practice, and consequently, increased student engagement:

> This gave me more strategies to use and ways of approaching science...I gained a lot more confidence in teaching [and learned] how to make science more inquiry-based. [This was] an area I was weak in, and so I was able to develop that. I think another area that was developed, too, were the leadership skills, the ability and learning how to reflect on my teaching. [As a result, I] was able to become more of a facilitator with my students, rather than the person imparting all the knowledge....I'd say it's benefited students in that they're taking more ownership and more responsibility in their learning, and are more engaged because they are the ones forming the questions, and therefore forming the investigations that they want to do. It relates later on to the real world, it's not just science, it's everything....I think that's very important.
> *—Teacher on Special Assignment, Professional Developer, California*

❖ *Compliance Review Teams:* Early in the funding period, WERC staff members Dr. Tania Madfes and Ms. Ann Muench provided technical assistance to California districts to help them align

activities with emerging State programs. In a similar vein, they participated in a number of Coordinated Compliance Review Teams for the California Department of Education to evaluate districts' use of Eisenhower Professional Development funds. As a result, they were able to help districts use their district Eisenhower funds to more effectively provide for the professional development needs of their teachers, as well as teachers from non-public schools (a criterion that often results in districts being out of compliance). Participation in this activity also provided Dr. Madfes and Ms. Muench with invaluable data concerning the needs among California districts for professional development in mathematics and science.

Nevada

Nevada has the smallest population in our region, but it is the fastest growing state in the nation. The composition of Nevada's citizenry is also rapidly changing—the state's minority population increased from 28% to 41% between 1990 and 1999. Currently, Nevada's K-12 student population is approximately 59% Anglo, 24% Latino, 10% African American, 5% Asian American and 2% Native American. These students are spread in an urban-rural dichotomy across the state. Over 80% of Nevadans reside in the metropolitan Las Vegas and Reno areas. The rest of the state is extremely rural; Nevada as a whole averages less than 10 people per square mile.

The focus of WERC's technical assistance to Nevada has evolved over the years based on identified needs that are critical to the state's systemic reform agenda. In the most recent reporting period, WERC staff members Ms. Libby Rognier and Dr. Art Sussman assisted with the development of a statewide assessment in science, whereas work in the previous reporting period focused on the development of a statewide assessment in math. This technical assistance has followed from earlier work, where WERC was very involved in facilitating the development of the Nevada State Mathematics and Science Standards. This reflects the state's changing priorities due to a progression in the education agenda. For example, having adopted the new academic content standards in 1998, including those developed for science and math with WERC assistance, the state decided to emphasize accountability in the form of a statewide high school exit examination.

Thus, Nevada underwent the process of implementing new Proficiency Exams for Mathematics and Science, which all students must pass in order to graduate from high school.

In this reporting period, WERC supported the development of the science portion of the Nevada High School Proficiency Exam (NHSPE) in the following ways:

- Worked closely with Nevada's new Science Consultant and Curriculum & Assessment Team Leader to assist in identifying key science education leaders and recommending people to involve in the writing of the Proficiency Exam;
- Reviewed items in the science item pool for appropriate content and format;
- Facilitated discussions among citizens and test directors on the relationship of NHSPE science items to postsecondary and career success; and
- Facilitated bias review (gender, ethnicity, and disabilities) of NHSPE science items.

(Because the test items are secure, it is not possible to include examples of this work in this report.)

The implementation of Nevada's statewide assessment system has been supported by professional development sessions facilitated by WERC staff. Most recently, WERC staff member Ms. Libby Rognier provided assistance to plan and implement the 2000 Science Leadership Institute for Clark County (Las Vegas), where she also directly facilitated a number of Learning from Assessment workshops. Moreover, at a Clark County summer training institute, she helped to equip 20 teacher leaders with the necessary skills to become professional development providers for their district during 2000-2001.

Comments offered during a client interview in Fall 2000 describe how WERC's assistance in developing the Nevada proficiency exams and supporting professional development for teacher leaders has had a positive impact on teacher leadership, classroom practice, and student opportunities to learn:

> Through WestEd assistance, we have a process whereby we have constructed, administered, and evaluated a high school proficiency exam, which is a high-stakes, criterion-referenced exam required by the state. [WERC has] influenced the format, general makeup of our high school proficiency exam, and how to communicate information about its construction. For schools, I think it's eliminated a lot of rumor and conjecture about who is doing what, where, when. It has provided some coordinated understanding of what is expected and how that expectation will be assessed. As a result of this process, there is greater desire to

take a good look at what teachers are supposed to be teaching, as far as standards, etc, and making sure that it's getting covered.

WERC helped us work with leadership conferences in which we brought representatives from all districts in to talk about NCTM-based standards, the Nevada state curriculum, and how to address the need to establish courses, curriculum, and program within the schools that would implement those standards or reflect those standards. As a result, many of the people who were trained have gone on to become exceptional leaders, both within their district and at the state level for mathematics education in the state of Nevada. All of them benefited from the standpoint that it helped them become more effective classroom teachers, and as a result of that, I'm quite sure that their students benefited.

—Math Coordinator, Nevada State Department of Education

In previous years, WERC provided financial and technical assistance to develop a statewide educational telecommunications infrastructure, the Nevada School Network (NSN), which has since distributed curriculum-based resources to Nevada educators, including an early draft of the Nevada Science Standards which enabled educators to actively participate in the review process. Access to the Network was offered to all 17 Nevada school districts as part of the goal to provide Internet access to every public school in Nevada. To help accomplish this, WERC staff provided professional development to teachers in the use of the Internet for classroom instruction, and participated in the Internet Task Force, a statewide group formed by the Nevada Department of Education to coordinate local electronic networking efforts with the NSN. These efforts helped to address the great need to improve communication for the state's widely dispersed teachers.

Over the years, in addition to technology workshops such as the one mentioned above, WERC staff provided financial and professional support to assist with math and science professional development opportunities and resources for Nevada teachers. This has included facilitation of workshops and small-group discussions focusing on a range of topics—including the *Toolkit for Systemic Reform*, authentic and portfolio assessment, assessment development, TIMSS findings, grant-writing, the use of professional development cases, standards development, and the writing and scoring of standards-based test items—at locales such as statewide mathematics conferences, the annual Nevada Indian Education Conference, and regional science leadership institutes. WERC further supported Eisenhower work in Nevada by participating in the reading of proposals and awarding of grants for the Eisenhower Professional Development Program Higher Education Projects.

Utah

Utah is a typically large, predominantly rural Western state. Unlike other states in the WestEd region, it has a comparatively homogeneous population. Over 90% of Utah's school age population is Anglo. Latinos, at only 5%, constitute the most numerous minority group. Utah is also unusual with respect to its combination of strong leadership from the State Office of Education combined with control at the local district level. A State Science Coordinating Committee and a State Mathematics Coordinating Committee help determine and implement policies. These committees consist primarily of district administrative personnel, and they meet quarterly with the respective State Science Specialist.

WERC's collaboration with USOE spans eight years, and represents the most stable and focused of our states' systemic reform programs. It is unique in having grade-by-grade, criterion-referenced testing aligned to the state content standards. In Utah, an annual $50,000 subcontract provided by WERC and coordinated with the State Department of Education has focused the attention of local leaders and WERC staff on addressing critical issues in the state's educational reform agenda, while leveraging about $200,000 annually in additional state and district funds.

Implementation of the Elementary Science Core Curriculum: The Elementary Science Core curriculum went through a multiple-stage revision and piloting process and was then adopted by the State Board. Beginning in 1995, the new core was disseminated to districts and teachers throughout the state. Professional development for elementary school teachers was coordinated by the State Office of Education and institutions of higher education and utilized the state's public television station and distance communication network to ensure the participation of essentially all of Utah's school districts. Lead teachers who received special training later served as trainers at local sites in conjunction with videos and television broadcasts. WERC helped to plan and support this crucial staff development with the Utah State Office of Education and the State Science Coordinating Committee. Needs assessments revealed that in Utah, as elsewhere, elementary teachers have comparatively little training and expertise in science content or process skills.

A trainer-of-trainer model served as Phase I of the inservice and included all of the elementary grades, K through 6. Approximately 100 teacher leaders in the selected grades participated in a three-day summer institute. In addition to implementing in their own classrooms what they learned at the summer institute, the teacher leaders committed also to providing at least two inservice experiences for teachers in their local school district. Data from the first phase of elementary inservice indicate that approximately 6,500 teachers attended follow-up inservice sessions, indicating that this trainer-of-trainer model actually succeeded in significantly amplifying the initial training.

The subsequent reporting period featured the second round of inservice training (Phase II) which initially targeted grades 2, 3 and 4. Phase II was not a repeat of Phase I. Instead, Phase II included new content information and activities; increased emphasis on making grade-level-specific connections between the activities and content with the standards and objectives of the Core Curriculum; and segments on technology and assessment that are tied to the Intended Learning Outcomes of the Core Curriculum. Phase II also included augmentation as appropriate to the targeted grade levels. Thus, the subsequent Phase II for grades 5 and 6 included components on technical reading and writing.

The most important lesson learned through this collaboration relates to the need for, and value of, continuing contact between the project director (Professor Marv Tolman of Brigham Young University) and the facilitators who participated in the summer institutes. Dr. Tolman went far beyond the call of duty (and the amount of his time that the project funds actually cover) in communicating with and supporting the facilitators at the institute and particularly throughout the school year. He helped them to obtain materials for their follow-up workshops and even arranged to visit as many of them as possible. Evaluation comments from facilitators enthusiastically attest to the value and importance of this continuing support from Dr. Tolman.

In addition, Utah has presented a challenge with respect to geography. Most of the population inhabits a corridor along the Wasatch front running from North to South, with the highest density around Salt Lake City. However, there are many school districts that exist outside of this corridor, covering a large geographical area, and containing comparatively few students/teachers. This

project has been based on districts, yet has had to develop mechanisms to enable participation by those districts that are very rural. Consequently, three participation options have been developed. Some have chosen to participate as a district. Others have clustered together for the inservice, sending one or two facilitators per grade level for the cluster and then bringing teachers of each grade level into a central location for the inservice taught by the facilitators. A third option has been for the rural districts to send their teachers to a nearby larger district to join their inservice.

WERC's support of Utah's professional development for elementary teachers has fostered the growth of teacher leadership while also leveraging additional resources for teacher enhancement and leading to manifold returns in the total number of teachers that are prepared as trainers. A client interviewed in Fall 2000 had this to say:

> [WERC] provided us with resources and expertise in implementing the professional development that is aligned to our core curriculum at the elementary grade levels, and they've helped facilitate that through funding as well as through providing technical assistance for the summer training.....We had teachers so excited from the summer training, when they went back to their districts, they were able to access teacher work days, teacher professional-development days, and teacher career-ladder days--they were able to access materials and equipment, district funds, as well as their Eisenhower and state staff development funds. So, by having a good, high-quality professional development in the summer, it means that when a teacher walks back in the district fully prepared, they act as a catalyst to access additional resources.
>
> The strategies that we're using [in our Phase II elementary inservice] are a constructivist model, where students are developing an understanding of science process skills, as defined by the intended learning outcomes in Utah. So, it's the hands-on, minds-on model where we try to connect the learning in science to an experiential base....[This] inservice trains in a cadre about 100 to 110 teachers each summer in an intensive inservice workshop, which [WERC] has been supporting for the past 6 years....then, using state monies, we send [the teachers] back to their districts [where they] train additional teachers...It's a model where we build capacity in the summer among cadres by intensive training....About 100 teachers that are trained in the summer typically turns into 3,000 trained teachers by the end of the school year.
> *—Science Coordinator, Utah State Department of Education*

In addition, the following comments from teachers were typical responses to questions posed as part of the project evaluation. They reveal the extent to which teachers have changed their practice as a result of their involvement in the project.

- *Have you changed your practice as a teacher of elementary science as a result of this experience? In what ways?*
  - "I've added more hands-on as well as the connections with literature and art. I'm more aware of the importance of teaching the process skills and assessing those instead of factual information only."
  - "For the first time I feel better about science within myself—that makes me a better science teacher. I teach with more knowledge and enthusiasm and the children and I are both learning a great deal."
  - "New and better strategies. More focused assessment."
- *Have your own elementary students improved their performance and/or attitude toward science?*
  - "Children are very enthused and look forward to science."

- "I believe my students understand concepts with greater depth."
- "I know they are talking to their friends about what we do because students in other classes have told me they wish they were doing what we are doing."
- "They have learned a lot of vocabulary and have much more appreciation for their environment. They watch for changes when experiments extend for several days and they don't groan when it is time for science and neither do I."

These results were echoed in the findings of a client survey that was administered collectively by all the Consortia in 1998 and 1999. Facilitators from the Utah inservice consistently told us that they enjoyed and benefited from the workshops, that they use more hands-on activities with their students, that they connect their teaching with the Utah science core, and that their students are much more excited about science and appear to have improved achievement. Included below are just a few comments that they provided in an open-ended response format.

- "Marv Tolman is an amazing resource to us. I appreciate the opportunity to be trained to use the science materials. The materials themselves are extremely usable and age appropriate."
- "This has been the most impressive and useful training I've ever attended. The reason for its success is simple—Marv Tolman. What a great motivator and wonderful instructor. He spent so much time getting and delivering materials for those of us being trained. What a great example to me and what an amazing inspiration he is to those of us he has worked with."

Implementation of the Secondary Science Core Curriculum: After its adoption by the Utah State Board of Education in July 1995, the revised Secondary Science Core Curriculum was disseminated throughout the state. In the current reporting period, Dr. Sussman continued to provide technical assistance for the new 9th-grade Earth Systems course.

WERC's technical assistance pertaining to the Earth Systems course helped to address two areas of need. First, few teachers had received training with respect to Earth Systems Science. Second, classes such as Earth Systems Science often attract students who are less likely to be science oriented—the other 9th-grade choice tends to be biology, which attracts more students who intend to pursue science-related careers. One approach that we adopted involves connecting the curriculum to the local environment. This approach aims to increase student engagement and also to broaden the teacher's perspectives and content presentation. WERC helped the Utah State Office of Education to obtain a very competitive grant from the national office of the Environmental

Protection Agency. This grant has supported two cohorts of teachers (one per year) in facilitating their students' engagement in environmental action projects that connect with the Earth Systems Science course. Dr. Sussman provided technical expertise with respect to enhancing the science content knowledge of the participating teachers. WERC also used EdGateway for this project to enhance communication among the teachers and project staff. In addition, WERC enabled the students to use EdGateway tools to tell the story of their project on the web with photos and accompanying text.

One of the outcomes of WERC's technical assistance to Utah has been the development of a versatile web-based infrastructure providing teachers with reliable access to resources and information to help them to align their instruction to the standards. This benefit is described in the following comment offered during WERC's Fall 2000 client interviews:

> One of the things that [WERC] has helped us with is our web-based communications systems here in Utah.... the internet capabilities of the programs they run out of WestEd Laboratory...give us a model for developing our own science home page, as well as a tool [which has] been valuable for our teachers. My qualitative feeling is that this has helped the teachers to align more carefully to the national standards, for one thing, and the second thing is it gives them a longevity. Our home page that we created, as well as the resources we've used from WestEd have put together a place where they can reliably go to find some information that's specific to their core curriculum.
> —*Science Coordinator, Utah State Department of Education*

One obstacle to enhancing the teachers' expertise and the students' learning of Earth Systems Science has been the comparative lack of materials for either teachers or students with respect to this integrated and very current approach to understanding planet Earth. In the course of working with Utah science teachers and with Utah facilitators who provide inservice for these teachers, we have discovered that they respond very positively to a conceptual framework based on three principles: cycles of matter, flows of energy, and web of life. This conceptual framework was developed and introduced to the Utah educators by Dr. Sussman. During this reporting period, he wrote a book that was co-published by WestEd and Chelsea Green Publications. The book, *Dr. Art's Guide to Planet Earth*, along with its interactive website (www.planetguide.net), aims to make the "systems science" way of understanding planet Earth more accessible to students and to teachers, and is thus an ideal resource for secondary science teachers. The website was developed through a collaboration with the Utah State Office of Education and features lesson plans and

experiments that support Utah course standards. The book and website are designed to be used for both professional development and as a classroom text, with the ultimate goal of helping students at participating schools to demonstrate higher achievement levels in these state-mandated courses. The book has received many accolades from noted scientists and science education leaders as well as awards from the NASA Earth Strategic Enterprise Education Products Review and from the Children's Book Council/NSTA which awarded it a "Selector's Choice" and an "Outstanding Science Trade Book for Children for 2001." A few review quotes are included below.

> This is an outstanding book. Vividly, clearly and concisely Art Sussman explains how our planet works and what can happen when the balance of nature is upset. It will capture the imagination of readers of all ages and invoke a sense of wonder. I absolutely recommend *Dr. Art's Guide to Planet Earth* - it deserves a place not only in every classroom but also every home.
> *—Dr. Jane Goodall, Ecologist and Author*

> I recommend this highly readable book for people of all ages who are interested in learning how the earth's physical and life systems are interconnected.
> *—Dr. Bruce Alberts, President, National Academy of Sciences*

> What a fun read. This book artfully explores Earth's systems while also engaging the reader's imagination. Complex ideas are presented in a way that is truly understandable! This isn't just for the kids; adults will find themselves reading the book to answer their own questions about how the Earth works.
> *—Dr. Bora Simmons, Director, National Project for Excellence in Environmental Education*

Many Utah districts and schools have purchased copies of the book to be used during the 2000/2001 academic year. In addition, Dr. Sussman provided professional development at two of Utah's largest school districts in conjunction with purchases of 1,000 books by each. [NOTE: ALL INCOME FROM BOOK SALES GOES TO WESTED TO SUPPORT EDUCATION PROJECTS.] Of course, the book is being distributed nationally, but we have described it here because the need of Utah teachers and schools played an important role in the book's development.

National and Regional Development Activities

This section of the report describes several national/regional projects which WERC has operated relatively independently of the other Consortia and where new tools and resources were developed. All of these projects were made possible by supplementary funding that enhanced

WERC's capacities to provide services and explore new ways to be more effective in our work. Two projects focus on the use of technology to enhance teaching and learning (EdGateway and *Tales from the Electronic Frontier*). Two projects have taken advantage of WestEd's expertise in case methodology (Professional Development Cases and Elementary Science Cases), while another builds on WERC's expertise with respect to students who are English Language Learners (Science for Linguistic Inclusion). A sixth project has contributed to the integration of assessment and professional development for teachers undergoing professional certification (National Board for Professional Teaching Standards). The final activity is an example of how WERC staff have been instrumental in assisting national educational organizations in the planning and implementation of regional conferences for educators (IAS Conference).

EdGateway

Since its inception, WERC has been engaged in obtaining information about the wide variety of programs, organizations and people that are important for mathematics and science education in our region and nationally. Since this information can be quite overwhelming, we have also struggled with developing ways to organize the information so that it is meaningful to us and to our clients: the teachers, schools, educators, students and parents in our four states. Finally, well-categorized information is not particularly useful unless people can get it in a timely, accessible and efficient manner. Based on the increasing trends toward electronic communication coupled with feedback from our clients and contacts, EdGateway has become an important focus of our work. As an ongoing project, EdGateway has evolved consistently with the changing needs of our clients. The following is a brief description of the system with specific examples of EdGateway's growth from the lessons we have learned during its development.

EdGateway is based on the World Wide Web and uses software tools that WERC has developed. It can be accessed, free of charge, at <www.edgateway.net>. During this project period, WERC has continued to develop and expand the features of this system. Development of parts of EdGateway have been funded through a grant from the Environmental Protection Agency

with the continued goal of creating a central electronic information clearinghouse for science, environmental, and math education.

EdGateway represents a new, cutting-edge development in interactive, web-based software that addresses the challenge of collecting, organizing and disseminating information. In brief, EdGateway puts the control of information in the hands of the organizations and the people themselves. In EdGateway, when an individual person or organization enters information about themselves, their organization, or their events, this information is immediately available to everyone. The person or organization can readily modify their information, post a message, or form a new discussion/collaboration group, which is immediately available on-line. Thus, an individual or organization can enter the information to serve their own immediate needs and at the same time, have that information immediately collated with others in the larger community.

EdGateway began and continues to serve three overlapping national communities: Science, Math, and Environmental Education. As EdGateway's tools continued to serve the purposes of varying groups, organizations, and regional efforts, new communities were created to provide an interactive component on their existing web sites. Each EdGateway community shares an interest in a common subject area, program, or regional focus and provides access to groups and organizations that are related to that interest area. Some of the communities created in this project period serve the Coalition for Essential Schools, Distance Learning Resource Network, the San Diego Science Alliance, and Project Tomorrow.

Bob Montgomery from the Coalition of Essential Schools remarked the following about EdGateway and our collaborative efforts: "Making connections between math, science, and environmental education and the school reform community was part of the original mission of EdGateway. EdGateway is a valuable tool for the CES national network. As we introduce people in the CES network to these interactive tools, we are discovering ways to modify and improve the EdGateway environment. Sustaining an on-line community represents uncharted territory for us all. We are learning as we go and sharing our learnings with each other. The potential uses of EdGateway are myriad."

The following comments offered during the Fall 2000 client interviews are further testament to the value and impact of EdGateway.

> I think the identification of potential resources and opportunities has been one of the critical contributions [from WERC]. For example, [they provided knowledge about and the means to use] EdGateway as a potential communications device and format for posting regional activities which would allow us to do a better job of coordinating and springboarding off each other.
> *—Math Coordinator, State Department of Education*

> We had a consortium person come out and do a training on EdGateway, and I think that has helped strengthen relationships in our environmental education efforts.
> *— Administrator/Science Project Coordinator, County Office of Education, California*

> [Edgateway has given us] both give us a model for developing our own science home page, as well as a tool with the programs that we're able to access...to share data and create websites for each of our teachers at EdGateway has been valuable for our teachers. My qualitative feeling is that this has helped the teachers to align more carefully to the national standards, for one thing, and the second thing is it gives them a longevity. Our home page that we created as well as the resources we've used from WestEd have put together a place where teachers can reliably go to find some information, online, that's specific to their core curriculum.
> *—Science Coordinator, State Department of Education*

Currently, a variety of diverse groups are making the greatest use of EdGateway. These include the NAAEE Affiliated Liaisons, the Texas Association for Environmental Education, the Utah Earth Systems Action Projects, and the California Science Teachers Association. In this reporting period, we used EdGateway to host interactive websites for national and regional conference. These websites were enhanced with tools that allowed online conference registration, pre-conference discussions, and a broader audience of conference participants due to on-line participation.

During FY00, WERC tabulated 149,918 user sessions with EdGateway, at an average of 2,883 sessions per week. The average user session is 23 minutes which is a long time by web standards.

Some aspects of EdGateway are best described by the system's evolution over time, based on the lessons we've learned from our clients and colleagues. The major component of EdGateway's communication capabilities is a messaging system. We started with a web-based system in which a person is sent a message at the end of the day saying that they had a message or messages waiting for them on the web at EdGateway. Users had to then go to the web in order to read and/or reply to messages. We found that many of our users do not multi-task on their machines and also have varying levels of difficulty reaching the web (this situation has improved over the past few years, but is still an important factor). We responded by including an option allowing messages to go to and originate from

people's regular e-mail systems. This approach satisfied most of our users, while still allowing those who prefer the original web-based system to select that option.

The modification of this messaging option made EdGateway more user-friendly for the vast majority of users. However, we found that this e-mail-based system has a down side in terms of understanding EdGateway and making maximum use of the site. If users experience EdGateway exclusively as an e-mail based messaging system, they do not appreciate its many web-based features (e.g., seeing threaded archived messages, finding out who the other participants are, using other EdGateway features such as the calendar). We have tried to encourage use of this dual system by communicating its benefits to users. One EdGateway participant, noticing this dual system, commented, "originally when I registered for this forum, I was only using threaded discussion [web-based]. Later, I discovered that the discussions are sent to my e-mail address. When I was in the threaded discussion area, I felt that I was psychologically participating with other people." Another remarked, "As I opened my e-mail and saw the lists of messages, I was overwhelmed reading each individually, I found that scanning the threads [on the web], I could participate and see the context of the messages."

A second issue we have addressed during this project period is the process by which a new user learns about the system, registers in it, experiences the system, and then proceeds to use more of its features. Knowledge of this process is essential to coordinating and starting up a group where you need to get a critical mass of users into the system rather rapidly in order for it to begin communicating and functioning. In addition to registering users into the system, we needed to help orient users so they could find the group or groups to which they needed to subscribe. With relatively inexperienced users and with a system that is continuously being refined and improved, we found that users needed a more streamlined process of finding resources useful to them.

One method that we used initially (and still use when it is most appropriate) involves a WestEd or group administrator registering a list of new users into EdGateway and then subscribing them to the new group. The administrator then notifies all the participants that they are in the system, tells them their assigned user names and passwords and describes how it all works. While this method

is relatively quick and efficient, the down side is that the user who then generally participates in discussions via their regular e-mail system has comparatively little understanding of EdGateway and its features that go beyond a standard listserv.

We responded to this by creating targeted entries (such as <www.edgateway.net/ca/science>). When a new or established user enters the system using that address (instead of the basic <www.edgateway.net>) it automatically subscribes them to the EdGateway groups that are particularly appropriate for them. Targeted entries can be created relatively easily and have been set up for several communities.

Another feature was added to address the disorientation that some new users experience when they register on EdGateway, i.e., not necessarily knowing what to do next when initially arriving at their homebase page. To direct users to groups, calendars, and events relevant to their interests, we transformed the first page that people experience into a community overview that highlights parts of EdGateway they seek, based on the point at which they entered the system. Targeted entries and community overviews have greatly helped to orient users by simplifying the process of registering and searching for relevant features.

Since EdGateway is a public site, its groups and discussions are thus accessible to anyone. While developing EdGateway, it quickly became obvious that some groups require a private forum available only to a predetermined group of participants. We addressed this by creating an option for groups to hold their discussion in a public or private forum. While EdGateway developers create private groups upon request, the group manager is then the only one who can find the group and add participants.

The above represent typical lessons learned and examples of how we have adjusted in the process of developing and implementing EdGateway. We learned these lessons by watching people use the system when we bring networked computers to conferences, by one-on-one instruction and feedback, by talking with our clients and probing for both specific and general feedback, and by observing how the system is being used over periods of time by different groups and kinds of users.

Tales from the Electronic Frontier

During the second fiscal year of this reporting period, WERC staff collaborated with teachers, advisory group members and other WestEd staff to develop and print 50,000 copies of *Tales from the Electronic Frontier,* a guidebook designed to help teachers use the Internet to support improved learning and teaching of mathematics and science. This publication was distributed to educators throughout the region and nationally via mailings, conference presentations, and hands-on workshops conducted by WERC staff. Over 225 math, science and technology organizations have used *Tales,* often in conjunction with professional development, as a vehicle for enhancing K-12 teacher awareness and learning. In addition to the book, WERC staff developed a web site featuring the complete text and illustrations from the book (www.wested.org/tales). During the ten-month reporting period from April 1998 through January 1999, this site recorded a total of 18,984 user sessions, resulting in 103,689 page views. The average user session length was 9 minutes.

Data collected from surveys in 1998 and 1999 showed that an overwhelming majority of clients who received *Tales* found it to be a useful tool for professional development and technology-related activities, as it illustrated and supported conversations about some effective uses of the Internet in math and science classrooms while giving teachers ideas for using technology to support improved learning. In addition, a State Department of Education collaborator provided the following comment during a Fall 2000 client interview:

> The book that [WERC] provided for our teachers, *Tales from the Internet,* was superb. Our teachers received that statewide and kept it, and it was kind-of early on in the internet arena, and so it gave them some insights as to how to integrate instructions into the classroom.
> —*Science Coordinator, State Department of Education*

Professional Development Cases

WERC has focused on working with those who provide professional development and resources for teachers. This group has included educators who work at informal science education institutions, a priority of the legislation and of the Secretary as described previously in the Science Adventures section of this report. Often isolated within a larger institution and responsible for providing worthwhile programs to teachers, these informal educators may have little opportunity to hone their

craft or learn new techniques. There are few places that provide support and understanding to those who are the actual leaders of change. To address this need, during this project period WERC staff member Dr. Tania Madfes guided the development and publication of *Dilemmas in professional development: A case-based approach to improving practice* (2000), a resource that presents cases as a way to provide meaningful professional development for the professional developer (included as Appendix D). This casebook addresses the quandaries that arise as the professional developer in science and math education interacts with teachers, administrators, scientists, volunteers, and staff. Each of the eight candid and highly readable cases in this collection provides an opportunity to examine an on-the-job dilemma as it occurs in the real world of teacher development. Read alone, they offer the vicarious experience of walking in another's shoes and the opportunity for self-reflection. In group discussions, they are especially powerful, allowing different points of view to be aired and examined. The casebook includes facilitator notes for each case and general guidance for facilitating case discussions.

Science Case Methods Project

The Science Case Methods Project has been an active WERC professional development project since 1998, serving teachers from districts across the San Francisco Bay Area. This project addresses a critical goal of standards-based reform—to build the science content knowledge and confidence of K-6 teachers so they can more effectively help elementary students learn physical science. The project also builds on WestEd's long-standing experience in case development, advancing the research to a new and much needed domain—science cases that address the physical science concepts most often misunderstood by K-6 students (and their teachers).

During this reporting period, WERC staff members Ms. Kirsten Daehler and Ms. Mayumi Shinohara organized and led science case discussions, worked with local teachers to develop new science cases, and assessed the effectiveness of project materials and findings. Over the past three years, with additional funding from the Stuart Foundation and NSF, the project has worked with a cadre of teacher case writers and collaborative partners to develop high-quality science cases and

facilitator materials. These cases are compelling teacher-written accounts of real classroom dilemmas and student conceptual misconceptions. Through in-depth group discussions led by trained facilitators, these cases serve as powerful catalysts for teacher learning.

During this time, the project has also facilitated more than 180 teacher case discussions, learned how best to link hands-on activities to facilitate case discussions, and explored a variety of successful models for using cases with teachers. As a result, the project has succeeded in developing and field testing a body of cases that can make a significant difference with teachers. Teachers participating in this project have been able to stretch their own cognitive grasp of content and pedagogy, while becoming more reflective about their own work. The following sections provide a more detailed look at the three strands of Science Cases work: (1) science case seminars, (2) science case development, and (3) evaluation.

Science Case Seminars: Our work with local partners continues to flourish. Since 1998, we have worked with more than 200 teachers from Oakland Unified School District (OUSD) as well as San Francisco Peninsula districts affiliated with Bay Area Schools for Excellence in Education (BASEE). It is a particularly relevant professional development program for these districts due to recently mandated standards and curricula in science. During this reporting period, OUSD teachers have been discussing eight cases on electricity and magnetism, and BASEE teachers have been discussing six cases. OUSD teachers also participated in five additional days of professional development led by project staff in a summer institute in 2000 prior to the start of the year-long program. These additional days focused on helping teachers to become familiar with the FOSS electricity and magnetism materials, deepening their understanding of related science concepts, and improving their pedagogy in terms of student assessment and questioning strategies.

Case Development: Case development in this reporting period focused largely on electricity and magnetism. By contrast, development in previous years spanned the entire domain of physical science, including such topics as force and motion, properties of matter, and light. The change to a single, narrower content focus was made in response to a lesson learned: teachers responded quite favorably to subject and grade-level specific groups. To accommodate this preference, we chose a

content area and focused our development efforts on conceptualizing and beginning the development of a comprehensive case sequence, one which can ultimately support a year's worth of case discussions and cover core concepts typically taught in the elementary grades

The topic of electricity and magnetism was chosen for several reasons: (1) an informal survey revealed that the teachers with whom we work perceive it as one of the most difficult science topics to teach and learn; (2) it is consistently taught in the elementary grades (there is wide agreement among standards and curricula as to which concepts should be taught and in which grades); and (3) our previous professional development work with teachers teaching elementary and magnetism revealed significant confusion in interpreting science concepts in terms of student performance. although teachers said they understood what concepts should be taught and how, they had difficulty saying, for example, what a fourth grader who understood a particular concept might say or be able to do.

We are now completing six new cases that have been shown to generate rich discussions of physical science content and student thinking. Four of these cases are on electricity and magnetism; the remaining two are on force and motion.

Evaluation: Results from written surveys, interviews with participants, and participant focus groups for the first two years of the project have revealed that the Science Case Methods Project has had a significant positive impact on teachers and on teachers' reports of classroom instruction. Impact has particularly been seen in teachers' content knowledge and confidence, pedagogical reasoning and attention to student thinking, and classroom instruction and students' opportunities to learn. In the evaluation methods used we were able to gather preliminary information on the outcomes for discussions and teachers. We were also able to infer classroom outcomes through teacher self-reports. Since our current instruments do not directly assess classroom and student outcomes, or teacher content knowledge, additional instruments are being developed to focus on these areas in the upcoming years.

Virtually all participants surveyed in both years of the project (1998-99 and 1999-2000) found science case discussions to be of greater value than other professional development programs.

This can be seen in the end-of-year survey data where 94% of participants reported that science case discussions were "better than most" or "among the best" professional development experiences, and nearly two-thirds (60%) rated science cases "among the best." When asked to explain their rating for the value of case discussions for this question, several teachers alluded to the overall experience and theory of case discussions. For example, one teacher wrote, "It really got to the heart of teaching...This is a very valuable way to address my own teaching and how to improve." Another teacher wrote, "...it delves into more of what my beliefs are on how children operate, what's more important to focus on in a lesson." Thus these teachers found the case discussion experience as a whole to be a valuable experience that directly related to their own teaching.

The analysis of the first two years' of data revealed a significant fulfillment of the discussion target outcomes, such as discussion, investigation, and careful thinking about the meaning of science, pedagogical issues, and issues related to student thinking; and participation in a collegial and inspirational learning environment. Not only did survey data reveal that these outcomes were prominent in case discussion meetings, but also teachers referred to these outcomes often when writing about what they perceived to be valuable about the case discussions. Therefore, the data revealed that the outcomes were fulfilled, *and* that these outcomes were particularly valuable to teachers' learning.

Data also revealed that teachers grew in physical science content knowledge and confidence. In the second year, 94% of participants agreed or strongly agreed on the end-of-year survey that their "understanding of physical science concepts is stronger" after participating in the discussions. Many teachers found also that they felt more comfortable teaching physical science to their students. As one Oakland teacher explained in a focus group at the end of the year, "I think it just made me feel more comfortable in teaching science, especially physical science...I don't feel at all uncomfortable about going in and saying, okay, let's see what happens! Because I'm learning at the same time..." An additional desired outcome of the project is an improvement in teachers' pedagogical reasoning and attention to student thinking. Data from all sources revealed that this

was, indeed, a prominent outcome of discussions throughout the past two years. In addition, all teachers reported that they have become more reflective as a result of their participation in the program.

In conclusion, the evaluation results for the first two years of the Science Case Methods Project suggest that this program has the potential to make a significant contribution to elementary school teachers' instruction of science. Overall, participating teachers report that they are teaching more science, and are teaching it using more diverse and insightful processes.

The K-6 Physical Science Cases project has learned and incorporated some important lessons, as follows:

- Peer support is a critical component of the case writing process. Peer-to-peer support among case writers has always been an important part of our case development process. But in response to feedback from writers, we modified the process to include shorter, more frequent teacher-to-teacher meetings. This year's writers, for example, work in two small groups of three and meet roughly once a month to share their progress and make critical decisions about their cases. Although project staff facilitate these meetings, much of the discussion and support comes from teacher-to-teacher interaction. Writers have reported that this development process works well, fostering a sense of camaraderie and helping writers to more efficiently complete quality cases.
- Explicit connections and strategies are necessary to achieve close alignment with standards. Like all WERC work, the Science Cases project strives to develop and disseminate materials and services that help clients align their instruction and assessment to national, state, and local standards. But recent events reiterate the importance of explicit and purposeful approaches to aligning with standards.

Science for Linguistic Inclusion

As documented by research studies and client requests, there is a pressing need for assistance to enable schools to better educate students from non-English language backgrounds who lack sufficient proficiency in English to achieve high content standards in mainstream classrooms.

Known as English language learners (ELLs), the rapid and continual growth in the number of these students in states such as California and cities such as Las Vegas makes this need all the more urgent.

Initiated in Spring 1997 with a planning grant from the National Science Foundation, Dr. Jerome Shaw's Science for Linguistic Inclusion (SLI) project continues to address this pressing need. The SLI project's mission is to create professional development resources that equip K-12 classroom teachers with knowledge and skills critical for designing and implementing quality science education with their English language learners. These resources include both processes (e.g., teacher professional development models) and products (e.g., materials for use in teacher professional development settings).

Within the broad framework of effective science education for English language learners, the SLI project focuses on classrooms in which the predominant language of instruction is English. The project's pedagogical focus is thus on the approach known as "sheltered instruction"—or, in California, "Specially Designed Academic Instruction in English" or SDAIE—in which specific techniques are used to make grade-level subject matter accessible to and comprehensible by ELLs. A key feature of this approach is the simultaneous development of subject matter knowledge and English Language proficiency.

The SLI project's two main strands of work are (1) creating robust materials for use by professional developers who work with teachers, and (2) providing rigorous professional development to teachers. Project materials include sample modified lessons from existing standards-based science instructional materials and engaging activities for adult learners. SLI professional development offerings include guiding teachers through the project's curriculum adaptation process—the SLI Seminar—and supporting teachers (including constructive review of videotapes of their own teaching) as they implement selected aspects of sheltered instruction—the SLI Academy. Both of these professional development models build a shared understanding of foundational topics such as language acquisition, sheltered instruction and selected science content and involve participants in multiple sessions typically spread over the course of a single school year.

In previous reporting periods, Dr. Shaw provided a one-day overall SLI orientation workshop to teachers, administrators and staff associated with the Phoenix Urban Systemic Initiative. He also worked with teachers and staff affiliated with the Language Acquisition in Science Education for Rural Schools, or LASERS local systemic change project, based at the University of California, Santa Cruz, on the adaptation of a unit from the Life Lab Science curriculum. This process included classroom piloting of modified lessons through the Spring and Summer of 1999.

As previously mentioned, Dr. Shaw conducted a SLI Seminar with teachers from the LASERS local systemic change project in California during the 1999-2000 school year. In September 2000, he held the first in a series of three multiple-day sessions of a SLI Seminar for over 20 elementary teachers affiliated with Clark County's local systemic change project in Las Vegas, Nevada. This teacher group is focusing on adapting a FOSS physical science module to better integrate science and literacy. After teaching the adapted module, participants will share their experiences in the Seminar's final session, scheduled for March 2001.

As a result of contacts within the network of Eisenhower Regional Consortia, Dr. Shaw piloted the SLI Academy with 15 secondary science teachers from schools associated with the Dallas Urban Systemic Initiative during the 1998-1999 school year. He subsequently facilitated a cycle of the SLI Academy with 12 middle and high school science teachers in San José, California during the 1999-2000 school year.

As outcomes, the SLI project has improved participating teachers' abilities to implement sheltered instruction and critically examine and adapt science materials to better meet the needs of their ELL students. This in turn has improved the educational experience and academic achievement of ELL students in science. Preliminary findings from a variety of data sources—including written evaluations, participant journals and classroom observations—indicate growth in several areas. As one teacher wrote in her journal after an Academy seminar in the Fall of 1998, "As a result of this session I have become aware of some of my weaknesses as an educator. I like the SIOP [Sheltered Instruction Observation Protocol] lesson plan format and think that I can improve my weaknesses by utilizing this format on a regular basis." Growth beyond

awareness is documented by these excerpts from Academy teachers' journal entries dated December 12, 1998:.

- "I truly started out in a rather skeptical manner—I, as you can see in our first journal [entry], could not figure out why I was here. As I have told you, I understand fully the objectives of SLI, and feel that any DISD [Dallas Independent School District] teacher could benefit."

- "I have been more focused on vocabulary and leading discussions on what words mean in context of the lesson and how they are applied outside of school. I am becoming more personable in relating to my students' comprehension by relating content and language to their world outside of the class. I am more cognitively aware of who my students are."

In addition, comments provided by a SLI participant during WERC's client interviews in Fall 2000 are further testament to the impact of the project:

> [We are] really taking an in-depth look at curriculum and aligning it to the standards and...really taking a look at what's the outcome we want for our students, before we start planning our activities, and being more clear about what our goals are....I think [SLI has] impacted teachers in that they really are taking a good, hard look at the units that they're teaching, and seeing where the gaps are, seeing where the standards are being addressed or not addressed, seeing how they can adapt lessons to make them accessible to second-language learners....
> *—Science Project Staff Developer/Teacher on Special Assignment, California*

Feedback from the implementation of SLI project activities pilot continues to help refine the project's professional development materials and models. We expect to provide cycles of the SLI Academy and Seminar as practicable in areas of need throughout the Far West region.

National Board for Professional Teaching Standards (NBPTS)

In the most recent reporting period, WERC Co-Director Dr. Steve Schneider has provided technical assistance to support the integration of assessment and professional development for teachers undergoing certification by the National Board for Professional Teaching Standards. WERC's ability to contribute to this endeavor stems from its substantial NBPTS experience in past years. For example, WERC staff led the development of the high school science assessment. In addition, we have piloted materials, helped candidates prepare for the assessment, and convened them afterwards for project evaluation purposes.

Teachers who go through NBPTS certification frequently describe it as the most valuable, self-reflective professional development experience of their careers. Once certified, these teachers serve as powerful mentors for other teachers within their communities—for those in preservice training

programs who are placed in these accomplished teachers' classrooms and for others already in the classroom who can benefit from the leadership of their nationally recognized colleagues. Yet, candidates going through NBPTS certification need a supportive infrastructure, tailored to their content areas, that will enable them to be well-prepared for the content-specific portions of the National Board assessments and will help maximize their professional growth throughout the process. Of particular concern is that teachers from diverse racial, cultural, and ethnic backgrounds have had proportionally lower pass rates than their "mainstream" counterparts. This "adverse impact" has lessened when candidate support is available.

To address this need, WERC has contributed since 1999 to the preliminary development and pilot-testing of content-based facilitator support materials, while also laying the groundwork for a facilitator support network. It is anticipated that the support of NBPTS facilitators will enhance the impact of professional development experienced by teachers during the Board certification process.

IAS Conference Planning & Implementation

Over the years, WERC staff members have been active in the planning and implementation of regional conferences in collaboration with partners. As an example, WERC staff member Ms. Ann Muench participated intensively in the planning of regional conferences for Improving America's Schools (IAS), held in Salt Lake City in 1999, and Sacramento in 2000. In addition, at the 1999 IAS conference she facilitated a day-long math institute for 90 educators.

The IAS conferences feature the U.S. Department of Education's priorities and programs, highlighting research and best practices during the many Day 2 Institutes. Their focus is comprehensive school reform from the whole-school perspective. As regional liaison for the one–day Mathematics Institutes at these conferences, Ms. Muench worked with the national design team in Washington, D.C., the keynote speakers (Dr. Patricia Campbell in 1999 and Dr. Judith Sowder in 2000), and the featured "case study" participants (Utah urban districts and rural sites from Imperial Valley, California, in 1999 and Math Renaissance Leaders in 2000) to create the Institutes.

Of the approximately 2500 conference participants in 1999, about 90 attended the Day 2 Math Institute, facilitated by Ms. Ann Muench, which emphasized "Growing Great Teachers of Mathematics" by improving professional development. Participants analyzed mathematics teaching and then used a self-assessment tool to identify challenges and opportunities in their own settings. They left with a better understanding of some key concepts of professional growth research and a better awareness of the practical realities of implementing high-quality professional development programs in the area of mathematics.

About 3500 educators attended the Sacramento IAS Conference in 2000. Of those, about 100 attended the Day 2 Mathematics Institute "Building a Comprehensive Mathematics Program in Your School—Important Elements to Consider." The goal of this Institute was to provide participants with information on how to recognize and develop effective and comprehensive mathematics programs by considering four important components: leadership and school governance; teacher mathematical and pedagogical strategies; mathematics curriculum content, instruction and assessment; and classroom environments. Evaluations were quite positive: participants wanted to know more from Dr. Sowder and her work on the recently–released NCTM Standards, as well as continue conversations beyond the afternoon breakouts on best practices and teaching communities, hosted by the Math Renaissance leaders.

In addition, Ms. Muench worked with the Eisenhower National Clearinghouse and other Regional Consortia to exhibit an extensive display of ENC products during the three-day conferences, while disseminating materials and building awareness of the Eisenhower Network efforts on national and regional levels.

Lessons Learned About Professional Development

Over the years of working with teachers, administrators, and informal educators in the professional development arena, the staff of the WestEd Eisenhower Regional Consortia have learned some important lessons about how to ensure the success of this work. Staff members found that their work in professional development was most successful when the following ingredients and characteristics were present.

Support:	There is adequate support staff to take care of logistics, material preparation, duplication, and administrative paperwork.
Personal Contact:	Multiple face-to-face contact opportunities that focus on changing classroom practice.
Follow-up:	Intensive sessions are important for creating the environment and for developing the bonding process of the group. However, follow-up is key to ultimate effectiveness and "driving home the point." Follow-up that is local is most valuable.
Long-term Involvement:	Multi-year contact makes for strong relationships that increase the chances for lasting impact. This is often difficult to achieve, however, due to changes in administration, teacher turnover, and shifting political winds.
Simplicity:	Tight identification of goals and design of activities, i.e., "the simpler the better."
Flexibility:	Although a sound basic structure/format is important, details need to be open to change along the way.
Dual Focus:	There is an advantage to focusing on content at the same time as pedagogy.
Practical Relevancy:	Success is greatest when the focus relates closely to the work of teachers in the classroom (offers something for immediate use) combined with a larger focus on changing teachers' thinking.
Multi-faceted:	Teachers are provided with experiences that allow them to look through multiple lenses (through the eyes of the student, the teacher, the research).
Reflection:	Time is provided to participants for reflection and digestion.
Inclusive:	Teachers are "at the table" during all phases (development, delivery, follow-up) so that the teacher voice is heard and the work is credible in the field. Teachers are also compensated and recognized for their time and expertise.
Persistence:	Creativity is used when the well-established obstacles/barriers are raised.
Networked:	Recruitment efforts that utilize internal (to a district) avenues where trust already exists are the most successful.
Evaluation:	Identifying what works, what doesn't, and why is important to strengthening capacity.

Evaluation Methodology and Findings

During the project period, WERC has relied on the Consortia and Clearinghouse Descriptive Data System (CCDDS), a client survey, and a client interview as consortium-wide data collection instruments. Analysis of data collected through these instruments has yielded useful insight into the extent and effectiveness of the consortium's activities.

WERC Activities: Our Participants, Services, and Focus Areas

Information related to WERC activities is compiled into a database, referred to as the Consortia and Clearinghouse Descriptive Data System (or, more informally, the Activities Database), which documents all activities in terms of content and participants. Updated every six months by WERC staff, the CCDDS contains quantitative information related to WERC activities, including the affiliations and quantity of our clients, as well as the nature, duration, intensity, and focus areas of our services.

The following charts present data that help us address the following questions: With whom do we work? What is the ratio among the kinds of services that we provide? In which areas do we focus our work? The data in these charts reflect activities that took place during any portion of the fifth fiscal year of the project (FY00). In calculating this data, only in-person activities are included, thereby excluding all large-scale dissemination and web-based activities. (Large-scale dissemination and web sites allow one to reach comparatively larger numbers of people, and therefore play a significant role in our portfolio of activities. However, those activities tend to be relatively anonymous and to qualitatively differ from the technical assistance and training that we provide. This is why such activities are excluded from the data shown below.)

In all five charts, it is very important to note that each activity counts as 1. In other words, presenting a talk once to 15 teachers counts as one activity. Providing technical assistance over a two-year period for a team of 25 teachers/administrators in a school district to develop and implement a K-12 mathematics program aligned with state and national standards also counts as one activity. Therefore, while these charts give a valuable perspective on our work, the data would

need to be analyzed more deeply to take into account the different magnitudes, significance and extent of different kinds of activities.

Table 1 presents the work affiliation of the participants in WERC activities during FY00. By far, the largest proportion of our client contacts (2653, or 70%) is affiliated with public or private school districts (i.e., Local Education Agencies, or LEAs), and virtually all of these client contacts are at public rather than private schools. The next three most common client affiliations include Institutions of Higher Education (4.3% of client contacts), Intermediate Education Agencies (3.8%), and Regional Service Providers (3.5%). The remaining 18.6% of our client contacts represent a mixture of affiliations such as community members and parents, state education agencies (SEAs), ENC/Regional Consortia, federal agencies, National Science Foundation, professional associations, informal science entities, business/industry, and other. It is important to note that the SEA client contact percentage of 2.5% does not adequately reflect the importance of those activities. Although few of our clients are affiliated with SEAs, our activities with these clients tend to be very intensive and important for our work.

Table 1. WestEd Eisenhower Regional Consortium: With Whom Are We Working?

CLIENT AFFILIATION	NUMBER OF CLIENT CONTACTS	PERCENTAGE OF CLIENT CONTACTS
Federal Agency	48	1.3%
State Education Agency	95	2.5%
Intermediate Education Agency	143	3.8%
School District - Public	2606	68.6%
School District - Private	47	1.2%
Institutions of Higher Education	163	4.3%
Professional Association	37	1.0%
Business/Industry	32	0.8%
ENC/Regional Consortium	72	1.9%
Regional Service Providers	134	3.5%
NSF (SSI/USI/RSI/LSC)	45	1.2%
Informal Science	39	1.0%
Community & Parents	112	2.9%
Other	50	1.3%
Unknown	174	4.6%
TOTAL	3797	100.0%

Note: Data shown is for in-person activities only (i.e., excluding large-scale dissemination and web-based activities)

Tables 2 and 3 depict the distribution of our LEA participants by level and role. As seen in Table 2, the greatest proportion of our LEA client contacts works at the elementary-school level (804, or 30%), followed by the junior high/middle school level (635, or 24%). Table 3 illustrates that of our 2653 client contacts at LEAs, 67% are classroom teachers, 9% are curriculum/content specialists, 8% are administrators, and 14% have other or unknown roles.

Table 2. Distribution of LEA Participants by Level

LEA CLIENT LEVEL	NUMBER OF CLIENT CONTACTS	PERCENTAGE OF CLIENT CONTACTS
Elementary	804	30.3%
Junior High/Middle School	635	23.9%
Senior High	400	15.1%
District Office Staff	309	11.6%
Other	21	0.8%
Unknown	484	18.2%
TOTAL	2653	100.0%
Note: Data shown is for in-person activities only (i.e., excluding large-scale dissemination and web-based activities)		

Table 3. Distribution of LEA Participants by Role

LEA CLIENT ROLE	NUMBER OF CLIENT CONTACTS	PERCENTAGE OF CLIENT CONTACTS
Administrator	223	8.4%
Teacher	1787	67.4%
Curriculum/Content Specialist	229	8.6%
Other	37	1.4%
Unknown	377	14.2%
TOTAL	2653	100%
Note: Data shown is for in-person activities only (i.e., excluding large-scale dissemination and web-based activities)		

The next two tables indicate the kinds of services that we provide and their focus areas. The caveats in interpreting these charts are the meaning of an activity as described before and the fact that an activity can be entered into the database as having multiple service categories and focus categories. For example, a technical assistance activity provided to an ethnically diverse group of community organizations to assist them in understanding performance assessment might be categorized under two service categories—technical assistance and network building—and under two focus areas—assessment and equity. These charts include only the first-priority service

category and the first-priority focus area. Thus, the actual extent and diversity of activities are under-represented.

With those caveats in mind, we can again make some useful generalizations from the data. Table 4 shows that training and technical assistance characterizes the majority (78%) of WERC's in-person activities and the majority (84%) of WERC's client contacts. With regards to the focus areas in Table 5, professional development is the most prevalent (37% of in-person activities), with programs and curricula ranking second (18%), and collaboration and communication as third (12%). Taken together, these three focus areas account for our work with the majority (68%) of our client contacts for in-person activities.

Table 4. What is the Ratio Among the Kinds of Services We Provide?

SERVICE CATEGORY (First-Priority)	PERCENTAGE OF IN-PERSON ACTIVITIES	PERCENTAGE OF CLIENT CONTACTS
Training	31%	59%
Technical Assistance	47%	25%
Dissemination	8%	12%
Network Building	12%	4%
Other	2%	1%
TOTAL	100%	100%

Note: Data shown is for in-person activities only (i.e., excluding large-scale dissemination and web-based activities)

Table 5. In Which Areas Do We Focus Our Work?

FOCUS AREA (First-Priority)	PERCENTAGE OF IN-PERSON ACTIVITIES	PERCENTAGE OF CLIENT CONTACTS
Professional Development	37%	45%
Programs & Curricula	18%	15%
Collaboration/Communication	12%	3%
Assessment	9%	10%
Standards	6%	13%
Technology	5%	4%
Equity	5%	3%
Evaluation	4%	4%
Other	4%	3%
Community Outreach	1%	>1%
TOTAL	100%	100%

Note: Data shown is for in-person activities only (i.e., excluding large-scale dissemination and web-based activities)

Standards and equity, two of the most important focus areas of our work, appear comparatively minor in these charts. With respect to standards, it is true that only 6% of our in-person activities have a first-priority focus on this area and they involve a relatively small

percentage of our participants. However, what the table does *not* show is that many of our FY00 in-person activities have standards as their second- or third-priority focus area, thus a total of 34% of activities focus on standards. Similarly, when we include activities focusing on equity as a second-, or third-priority focus area, we see that the proportion of this type of activity doubles during FY00. It should also be noted that our activities focusing on standards and equity are very important for systemic reform, and we devote considerable time and effort to them. In particular, almost all our activities that focus on equity were intensive. In addition, work related to science standards in California may count as only one activity, but it represented a very large amount of staff time and other WERC resources.

In the case of equity, although we have tended not to provide professional development or technical assistance focused on equity per se, the vast majority of our technical assistance, professional development, and collaboration building activities involve people who provide training, resources, and other services to schools that have large populations of under-served students. This is one of the key criteria that we use in selecting projects with which to collaborate. Examples include our work with the Arizona Tribal Coalition, San Diego Science Alliance, the three California mathematics professional development projects (MRK-12, Bay Area Math Project, Math Cases), the Science for Linguistic Inclusion project, and the Elementary Case Methods project.

Indicators of the Eisenhower Math/Science Consortia and Clearinghouse

The evaluation measures the outcomes of WERC's work in terms of a set of performance indicators. Developed and refined by OERI with input from the Consortium directors and evaluators, these indicators enable the Consortia and Clearinghouse to gauge their progress toward program objectives while capturing the quality and quantity of their work and its impact on mathematics and science education. The OERI indicators are organized around the general goals of the Consortia as delineated in the authorizing legislation and more specific objectives in each of the three primary service areas: technical assistance, dissemination, and collaboration. The indicators correlate with the

scope of work outlined in the legislation that authorized the Program and the Department's Request for Proposals for the Consortia contracts.

Each consortium was asked demonstrate the quality and impacts of its work by collecting and analyzing performance data and relating it to the OERI indicators that correlate most closely with its work. Since the indicators are for the national program, each consortium is not required to meet each and every indicator. WERC is reporting on all indicators except Indicator 1.5.

Data Sources for the OERI Indicators: In order to report on progress in meeting these indicators, the Consortia and Clearinghouse rely on three data collection instruments which were developed nationally and administered regionally. The first, described above, is the CCDDS database, which contains quantitative data about our activities. Qualitative data, on the other hand, has been collected via client surveys and client interviews. Both the surveys and interviews served as tools for gauging clients' perceptions of the quality, usefulness, and impact of Consortia products, services, and collaborations.

The survey instrument was pilot-tested in 1997 and administered to a purposive random sampling of clients in Fall 1998 and Fall 1999. The number of surveys completed and returned by WERC clients totaled 165 in 1998, and 124 in 1999. Each year, the sample of survey recipients included participants in training, technical assistance, and collaboration/networking activities. Many clients in the sample had also participated in large-scale dissemination activities. The choice of activities to survey and the number of participants to survey from each activity were guided by an effort to accurately represent of the work of our consortium. For each activity, the pool of prospective survey recipients was developed by targeting those who had received a greater number of hours of service or training (with the assumption that participants who received more hours would provide a more informed response). From the resulting stratified sample, recipients were chosen randomly. In both years, the survey was administered primarily through the mail (in 1999, one subset of clients received and completed the survey during a workshop). Each client received a customized cover letter with the survey. In 1999, 242 surveys were distributed, and 124 were

returned, yielding a 51% return rate. In 1998, 165 of 393 surveys were returned, producing a return rate of 42%. Appendix E contains a copy of the 1999 participant survey with results.

In 2000, to obtain additional client data for the Network's five-year evaluation report, the Network Evaluation Committee decided to design and conduct client interviews instead of administering the annual mail survey. The interview protocol, administered by each consortium and the Clearinghouse in October 2000, was designed to address selected OERI performance indicators, as was the survey. However, in contrast to the survey, the interview was expected to yield richer, more in-depth qualitative information that is particularly pertinent to client outcomes/impacts and lessons learned during the grant period.

Client Interview Methodology: Interviews were conducted with a purposive random sample of 16 WERC clients who were involved in FY00 activities. The sample included clients who are, as described in Indicator 1.3, "teachers, administrators, and providers of professional development who participate in the Consortia's continuing technical assistance" and clients who are, as described in Indicator 1.9: "participants in Consortia partnerships, collaborations, teams, and networks." WERC's sample conformed to the Network's sampling recommendations, thereby including clients with greater *intensity, longevity,* and *breadth* of involvement with the consortium; a broad range of professional *roles*, including clients who work with *at-risk populations;* and clients from both the *math and science* education communities. These sampling considerations were followed to help ensure that respondents had a greater degree of experience with WERC and could therefore give richer, better informed responses, while also ensuring that the diversity of WERC's client base would be adequately represented and that the sample would reflect the work carried out with these different populations.

The sample for WERC was developed by first generating a "pre-sample" pool based on the sampling criteria and considerations. The sample was stratified into two sub-samples by type of activity (training/TA or collaboration/networking). From this pool of clients, a random numbers table was used to randomly select a sample of 16 clients along with an oversample of 8 clients.

The evaluator then reviewed the sample to see whether it was representative of WERC's work. When it was found that two WERC projects were overrepresented, one did not make the final random cut, and one state was insufficiently represented, 3 of the 16 in the sample (and 1 of the 8 in the oversample) were replaced with clients randomly selected from a subset of the pre-sample pool.

Potential respondents were informed of the interview by an advance letter which was sent by email or fax. Many of the respondents were later contacted by telephone to schedule the interview. WERC staff conducted and tape-recorded all interviews over the phone. Of the final sample of 16 interviewed clients, 14 had participated in one or more training/TA activities, and 8 had participated in one or more collaboration/networking activities.

Interview Findings: Overall, the client interview data were consistent with the survey data collected in previous years. Although the intent of the interviews was to collect qualitative data to "add a human face" to the quantitative survey data—and this it did, indeed, accomplish—the interview also contained some closed-ended questions which yielded some insightful data about our clients' general perceptions of WERC's work.

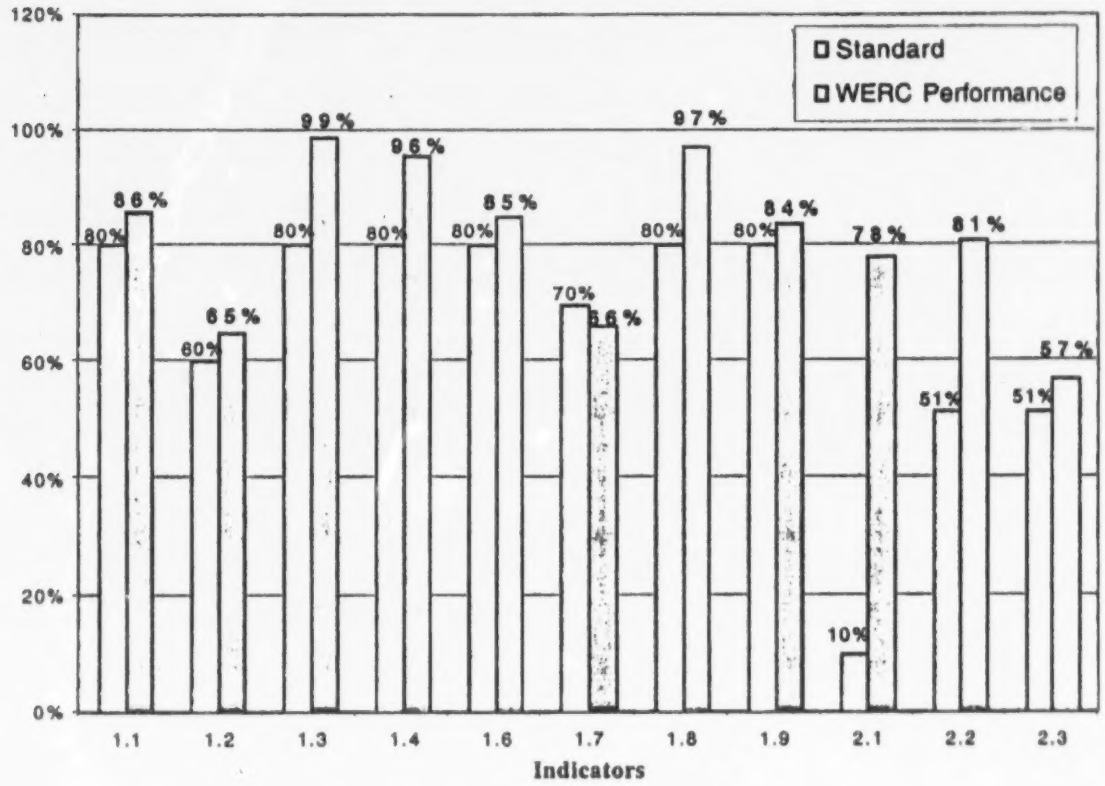
As mentioned earlier, 14 of the 16 interviewees had participated in a training/technical assistance activity supported by WERC. According to all 14 of these clients, this activity met or exceeded their expectations and it helped them to improve instructional practices. Over 90% (13) of the 14 training/technical assistance recipients reported that this activity helped them to align curriculum and/or instructional practices with the National or State standards. Over 85% (12) of the clients reported that the training/technical assistance helped them to implement assessment aligned with National or State standards, and the same percentage confirmed that it helped them to meet the needs of at-risk, underrepresented, and/or underserved students in math and/or science. Of the 7 clients who are/were classroom teachers, over 85% (6) reported that the training/technical assistance enabled them to improve student engagement, and over half (4, or 57%) reported that it enabled them to enhance student performance in math and/or science.

Eight of the 16 interviewees had participated in a collaboration/networking activity with WERC. All 8 of these clients reported that their collaboration with WERC strengthened relationships, increased access to resources, informed policy decisions, and helped them to work more effectively. The majority (7, or 88%) also noted that their collaboration with WERC increased service coordination and/or leveraged resources/efforts for greater impact. The same proportion (7, or 88%) confirmed that this collaboration met or exceeded their expectations. In addition, most of the partners (6, or 75%) also noted that the collaboration provided benefits that would *not* have otherwise been afforded.

How Does WERC Stack Up *vis-a-vis* the Indicators?: Data from the CCDDS, client survey, and client interview are described below in correlation to the indicators and provide a solid indication of the quality and impact of the Consortia's work. The following chart illustrates the extent to which WERC has met or exceeded each of the indicator "standards" during this reporting period, based on the most recent quantitative data available: CCDDS data from FY00 and client survey data from Fall 1999. (The quantitative data from client interviews, though representative of overall trends, is not used to show evidence of indicator attainment due to the small sample size of 16. Instead, client quotations are included under the relevant indicators to paint a picture of how our work has impacted clients.)

The chart shows that WERC exceeded the standard for 10 of the OERI indicators. The indicator exceeded by the largest amount is Indicator 2.1: Volume of Dissemination. On this measure, WERC increased the volume of its electronic dissemination by 78% from the previous reporting period—68 percentile points more than the 10% increase that is mandated by the indicator. The technical assistance indicator that was exceeded by the largest margin (19%) is 1.3: Improvements in Participants' Practice. The standard for Indicator 1.3 is 80%, whereas WERC's performance on this measure, based on data collected from client surveys, was 99%. The only indicator that was not met (1.7) was missed by four percentile points. More detailed information pertaining to WERC's performance on each indicator follows the chart.

WERC Performance vs. the Indicators



Note: For Indicators 1.1, 1.4, and1.9, performance was calculated by averaging the results from the relevant 1999 survey items.

INDICATOR 1.1: Alignment with standards. *At least 80% of participants in Consortia technical assistance activities will report that the content of Consortia technical assistance is explicitly aligned with National or State content and performance standards and/or is focused on assisting in the implementation of National or State standards and practices related to their attainment.*

1999 survey recipients who had participated in any WERC-related professional development/training or technical assistance activities were asked to respond to questions that related to this indicator. Results were as follows:

- **82%** of 117 respondents reported that the content of the professional development /training and/or technical assistance received was *explicitly aligned with state and/or national standards* to an "extensive" degree.
- **86%** reported that the content of the professional development/training and/or technical assistance received was *explicitly aligned with high-quality curriculum* to an "extensive" degree.
- **90%** reported that the professional development/training and/or technical assistance received was "extensively" *focused on implementation of practices to attain high standards.*

Comments offered during the Fall 2000 client interviews illustrated how this focus on standards alignment in WERC activities benefited clients. The following quote is from a teacher in an Arizona public school district that adopted a new, standards-based math program. Here, WERC staff helped educators to align their assessments with the standards.

> [Previously,] a student may have been given just the one score on the whole assessment [and] you couldn't tell by looking at the score what the students were really mastering...but now, after our revisions working with WestEd, there may be three scores for each one relating to different components. And it's a much more standards-matched kind of thing, so that now when... we're looking at state standards, we're much more able to pinpoint a particular assessment and what state standards have assessed... [and] now by looking at the scores, you can tell what [students] can and can't do....It's going to be a real motivator for [my students]...and it's going to help us beef up, from a diagnostic sense, where we need to keep working.
> *—MS Math Teacher/Trainer, Public School District, Arizona*

Another client, this time a California content specialist, describes the impact of the Learning from Assessment workshops which WERC provided in her district:

> [Through the Learning from Assessment framework,] ...the teachers started working on a matrix to see where their curriculum, their textbooks that they were adopting and supplemental materials, really were meeting their standards. As a result, the teachers feel like they have a plan for meeting the standards. With the goals of the standards in mind...we're looking at our students to see how they're performing as we're doing our lessons....As a result, there is more purposeful teaching happening, and it's meeting more varieties of student ability needs.
> *—Curriculum/Content Specialist, Public School District, California*

As a result of the Tribal Innovation Program, which included sessions on standards-aligned instructional strategies and assessments facilitated by WERC staff, a participant described what she felt was the most significant outcome from this professional development:

> You know how you always think, when you buy a textbook and you follow a plan, and you follow their setup, that everything should fall into place. Well, because of the WestEd program, we looked at our textbooks and found that they were not meeting the standards by any stretch of the imagination. So we found out where we were lacking, and what we had to do to correct it. We also found out that...we were

probably teaching at a lower level than we should be for the grade level. So that was a help. We've gotten our students on line, we've done a lot more assessments....[For me, the most significant outcome from TIP was] aligning my lessons to the standards, and knowing...that the textbook wasn't the god....I had a choice. I have the standards as a guide, and as long as I meet these standards, I don't have to follow this textbook, and say, 'All right, read page 21 through 23, and do the 40 problems at the end of the chapter.' So, to me, that was...kind-of like freedom.
—MS Math Teacher, BIA School, Arizona

INDICATOR 1.2: Intensity of technical assistance. *At least 60% of Consortia technical assistance activities will be 12 hours or more.*

Analysis of CCDDS data reveals the following: of WERC's 82 training and technical assistance activities that took part during any portion of FY00, 53 (**65%**) of them had a length of 12 hours or more, with over one-fourth (15) of those intensive activities providing more than 60 hours of service.

In addition, 1999 survey respondents were asked to indicate the length or duration of all the WERC-related professional development/training and/or technical assistance they received from October 1998 through September 1999. 82% (93) of the 114 respondents indicated a length of 12 hours or more.

INDICATOR 1.3: Improvements in participants' practice. *At least 80% of the teachers, administrators, and providers of professional development who participate in the Consortia's continuing technical assistance will report improvement in their practice.*

Survey recipients who had participated in any WERC-related professional development/training or technical assistance activities were asked to indicate the extent to which it enabled them to improve instructional or job-related practices/behavior in mathematics and/or science. **Ninety-nine percent** of the 117 respondents to this item indicated that their participation "moderately" or "extensively" enabled them to improve their practices/behavior, with nearly three-quarters (73%) reporting "extensively."

In addition, the Fall 2000 interviews asked clients to cite examples of ways in which they have changed their instructional practice as a result of WERC-sponsored professional development/training and/or technical assistance. Some of their responses are shown below.

We've had a lot of help [from WERC] with leadership focused on teacher leaders as well as school administrators and school board members. We formed close to 100 leadership teams as a result of three multi-state, or region-wide, leadership academies, institutes, that we've run. And in each one, we've had WERC personnel make presentations or lead panel discussions or support other presenters and staff in the

> institutes...Those teams come from districts in which we do a great deal of professional development, with WERC as well as with other partners.... there's no question that their efforts have led to increased leadership that are knowledgeable about school reform, particularly in science and math.
> *—Staff member, UCAN Rural Systemic Initiative*

A teacher participant in the Science Case Methods Project describes how the project changed the way in which she thinks about and approaches science teaching in her elementary classroom:

> For me, it's helped me in...thinking about how I'm going to [improve my teaching and enhance student outcomes]. How to think about and how to approach it so I CAN do it...[The case studies] make me far more aware...of what has to be done, and how it has to be done sooner and better...[The case study discussions have] affected my mental approach, and how I set up what I'm doing with the children.
> *—Elementary Teacher, Public School District, California*

A Tribal Innovation Program participant describes how the program has impacted her classroom practice:

> ...a lot of the things that I do now are more activity-based and real-life situations, more manipulatives....I now use activity-based assessments....and rubrics so that students know exactly what they're expected to do, and what's expected of them. They know what level they can go to, or what they'll need to do to attain a higher level in their work.
> *—MS Math Teacher, BIA School, Arizona*

A state department of education staff member describes the impact of a professional development session facilitated by WERC in Nevada:

> ...at one of our meetings, [WERC staff members], did a training on multiple intelligences and how to construct lessons and activities that would address multiple intelligences, and virtually all of the teachers, primarily elementary teachers, said that it helped them to get better insight on how to adapt instruction to the kids in the classrooms. I have heard from some those teachers, in conversations, that students have become more actively engaged in learning.
> *—Math Coordinator, Nevada State Department of Education*

INDICATOR 1.4: Improved student performance. *At least 80% of teachers who participate in the Consortia's continuing technical assistance will report improvements in student engagement and/or student performance.*

Survey recipients who had participated in any WERC-related professional development/training or technical assistance activities were asked two questions related to this indicator, and the 117 clients who responded to this item tended to be very positive.

- **94%** of the respondents indicated that the WERC professional development/training and/or technical assistance "moderately" or "extensively" enabled them to improve student engagement in mathematics and/or science; and

- **97%** of the respondents indicated that their participation "moderately" or "extensively" enabled them to enhance student performance in mathematics and/or science.

In addition, the interview asked clients to cite examples of ways in which WERC-assisted improvements to their instructional practice have enhanced student engagement or performance in their classroom. Some of the responses are shown below.

For example, WERC-supported Learning from Assessment workshops have provided teachers with the tools to align their math curriculum and assessment with the standards. Ultimately, this has helped to foster improved student attitudes toward mathematics:

> ...[teachers] realize where the misconceptions or where the misunderstandings are for the students that weren't performing where anticipated by the teachers, and they have more information now to instruct them appropriately so that they can fill the gaps that are missing for those students. Students' attitudes about mathematics have changed a lot, positively, where they enjoy doing mathematics.
> *—Math Curriculum/Content Specialist, Public School District, California*

A participant in the Tribal Innovation Program describes how student engagement has improved since she implemented new teaching strategies supported by the program:

> ...we do projects in order for me to assess the knowledge that the students have, their working knowledge as opposed to just regurgitation of facts. So, now I teach more to a 'why do we need this,' even as far as algebra. More hands-on, more relevancy-based... I guess the only way I can sum it up, is that I was out for 4 days because I had bronchitis. And when I came back, my students said, 'Oh, we're so glad you're back, because now math can be fun!'
> *—MS Math Teacher, BIA School, Arizona*

Another client describes how a two-year teacher training program supported by WERC had a beneficial effect on student outcomes.

> In all of our schools, we can show increased math or science attainment, not in all grades, but certainly in the grades in which we had the greatest number of teachers involved, and that would be in the elementary grades....and slight improvement in the gap between minority and non-minority students.
> *—Staff member, UCAN Rural Systemic Initiative*

INDICATOR 1.6: Participation by individuals who will assist or train others. *At least 80% of participants in Consortia trainer of trainer activities will go on to provide professional development or technical assistance based on the technical assistance they received from the Consortia.*

The survey asked those who had participated any WERC-related professional development/training activities or WERC-related technical assistance activities whether they

participated in an activity in which they were expected to go on to train or assist others. Sixty-five of the 115 respondents to this item (57%) indicated "yes."

Of the 65 clients surveyed who had participated in trainer-of-trainer activities, **85%** went on to train or assist others based on the training or technical assistance they received. In addition, another 9% replied that they had not had time to train or assist others yet, but they plan to do so in the future.

INDICATOR 1.7: Targeted services. *At least 70% of the district and school staff who participate in the Consortia's continuing technical assistance will work in districts or schools with a majority of students who are eligible for free or reduced lunch.*

Survey recipients who work at a school were asked to indicate whether the majority of students in their school are eligible for free or reduced-price lunch. Sixty of the 91 clients who were able to respond to this question, or **66%**, indicated that this was the case for at least half of their school's students. In addition, four-fifths, or 48, of these 60 clients noted that 75% of more of their school's students were eligible. Another survey item asked recipients who had participated in any WERC-related professional development/training or technical assistance activities to indicate the extent to which it enabled them to improve their ability to meet the needs of at-risk, under-represented, and/or under-served students in mathematics and/or science. Eighty-five percent of the 117 respondents to this question indicated that their participation in WERC activities "moderately" or "extensively" enabled them to improve their ability to reach this goal.

In addition, analysis of CCDDS data shows that 74% (1595) of the 2160 total LEA educators participating in WERC's intensive training/technical assistance activities during FY00 worked in schools serving at-risk students.

Quotes from the Fall 2000 client interviews illustrate the impact of WERC's targeted services. For example, a LASERS staff developer described how WERC-supported workshops helped LASERS teachers to integrate science content and ELL teaching strategies into their summer school, which ultimately impacted students. All of the K-6 students placed into the summer school were at

risk of being retained. But during the summer school, she explained, the students were completely engaged, and there were very few discipline problems:

> ...you didn't see kids acting out because they were totally engaged in the science....It's interesting to see how at the beginning of summer school, they're in the garden, and they're kind-of looking around, and halfway into summer school, you couldn't get them out of the garden. They wouldn't go home.
> *—Science Project Staff Developer/Teacher on Special Assignment, Public School District, California*

This participant went on to remark that students' language development level improved by 4 weeks to 6 months, just during the four-week summer school. A district client in Nevada described how his district's professional development program, which includes sessions led by WERC staff members, targets teachers working with at-risk students:

> ...we have focused on providing workshops at [our at-risk middle schools], encouraging teachers from these schools to come out and get engaged in all of these workshop and training activities that have been provided. There's been a special effort made to have those teachers from those high-poverty, low SES schools to come in and participate in these activities, to bring that back to their classrooms.
> *—Secondary Science Coordinator, Public School District, Nevada*

While illustrating how services were targeted by the Tribal Innovation Program, a client describes WERC's unique role in working with Native American populations:

> [This program worked] primarily with BIA schools and on the reservations.....I think it would have been difficult for another organization to work with the Native American districts that we work with. I think a lot of the other organizations either didn't feel competent to work with them, or were restricted for other reasons from working with BIA or native schools.....the students who benefited from the teacher training, the alignment and so on, were almost 100% Native American. The professional development and TA given to our coalition leaders, in turn, supported their ability to help the Native American and Hispanic communities that we primarily serve. In UCAN, we have something like maybe 12 to 18% who were non-minority. The rest of our student population, which is close to 200,000 students, were minority students. So, the impact was pretty large. We also had a Hispanic Issues conference, and we also got some support from WERC on not only preparing that, in fact [WERC staff] was very instrumental in...organizing that institute, but they also offered support at the institute itself. And from that, we've come up with a series of 'Issues' documents that we're putting into a 'Proceedings' document that I think would be a very fine guide for science/math reform for Hispanic populations. That guide is being developed now.
> *—Staff member, UCAN Rural Systemic Initiative*

INDICATOR 1.8: Volume of collaboration. *At least 80% of Consortia activities will include collaborators from one or more stakeholder groups in planning, product development, and/or service delivery.*

According to CCDDS data, 112 of the 115 activities occurring during FY00, or **97%**, were activities involving collaborators from one or more stakeholder groups, and many of these involved multiple collaborators. The most common collaborator was public school districts (for 48 activities). The next most common collaborators (and the number of activities in which they collaborated with WERC) include: institutions of higher education (35 activities); National Science Foundation entities

such as SSIs, USIs, RSIs, and LSCs (35 activities); ENC/Regional Consortia (31); professional associations (27); state education agencies and intermediate education agencies (26 activities each); regional service providers (24); business/industry (19); informal science entities (17); "other" (14); federal agencies (13); community members/parents (8); and private school districts (2).

INDICATOR 1.9: Impact on collaboration and networking. *At least 80% of participants in Consortia partnerships, collaborations, teams, and networks will report that value was added by addressing significant concerns; influencing policy and practice; providing coherence to reform efforts; helping to sustain reform efforts; strengthening relationships; increasing service coordination; increasing access to resources; or leveraging resources.*

Analysis of the 1999 client survey data revealed that a total of 78 of the 124 survey respondents participate in Consortia partnerships, collaborations, teams, or networks. (More specifically, 56 of the 124 respondents reported having collaborated with WERC in planning, product development, service delivery, resource provision, and/or other ways. In addition, 60 respondents indicated that they are a member in one or more WERC-related collaborative groups.) These collaborators were, in turn, asked to indicate the extent to which their collaboration with WERC brought about five possible results. Their responses were as follows:

- **82%** of 56 respondents to this item reported that their collaboration with WERC *strengthened relationships among collaborators.*
- **82%** of 55 respondents indicated that the collaboration *increased coordination in providing services.*
- **87%** of 56 respondents confirmed that the collaboration *increased access to resources.*
- **81%** of 56 respondents noted that the collaboration *leveraged resources and efforts for greater impact.*
- **88%** of 56 respondents reported that the collaboration assisted them in carrying out their work more effectively.

(For each of the five measures above, the percentage shown represents clients who reported that the collaboration brought about the specified outcome to a "moderate" or "extensive" degree.)

The impact of WERC's collaboration and networking activities was highlighted by several clients during the Fall 2000 interviews. For example:

> The listserv [that WERC has developed and maintained for us] is a web-based discussion forum that connects about 150 participants representing environmental organizations as well as educators....Just using the listserv is helping us coordinate our work. It's saved us time and allowed us to be more efficient, and thus have more time to do other things with teachers....It's made it easier for me do what I need to do.
> *—Coordinator, Environmental Education Project, California*

> We've had technical assistance from WestEd to help support our participation in some national activities, to communicate with other state leaders. We've had some support to help us take people from our state to meet with leaders from other states to exchange ideas...[As a result,] we're seeing a greater willingness among a larger group of people to share information, to work collectively, and to plan collectively, and to coordinate their activities.....[This helps our leaders to become] aware of what's out there, how to get at it, and how to use it. Who to contact, etc. This in turn will allow them to do a better job with the teachers, administrators, school and community people, that they are trying to train, influence, or otherwise provide information to. And this in turn will benefit those people because it will become systemic and it's all tied together....
> *—Secondary Math Coordinator, Nevada State Department of Education*

> ...we had a number of meetings that [WERC staff] and others helped the partners think about ways of collaborating with each other as well as with us, so that the partners saw a benefit to themselves as well as direct benefit to UCAN coalitions and schools....As a result, they were able to bring together the providers and prepare the providers to have a common approach to science/math reform at the leadership institutes to bring their various expertise into focus for the institutes. So, we didn't have a grab-bag of activities, but rather, a very well-structured series of institutes...by helping us coordinate our partners, we got much more direct benefit to our coalition and schools because... we were able to cull from the partnership better focused resources that we hadn't identified before.....I think that having WERC as a major partner increased our efficiency as an organization and thereby we were able to impact—more quickly—reform at the local level. So I think that [this] early intervention...really helped move the reform process along.
> *—Staff Member, UCAN Rural Systemic Initiative*

Other clients described how the training/technical assistance activities supported by WERC effectively strengthened relationships and enhanced the level of collaboration among stakeholders:

> ...one of the side benefits is the collaboration that we get between teachers, the exchange of ideas, sort-of the energy that comes out of these workshops that's ill-defined and hard to measure, but it's very real. I would say that this has brought about results in the classroom....
> *—Secondary Science Coordinator, Public School District, Nevada*

> ...what Arizona Tribal Coalition did was come in and provide a forum and use WestEd to bring representatives from each of the 8 schools together....these are BIA, Catholic mission, charter, tribal, and our public school district [who] have not communicated together at all in the 30 years that I've been involved in the community....[Now they meet] every month and sometimes twice a month....That was one of the very positive things that occurred...bringing these people together to talk, every month, and finally working through their isolation. The worst enemies of tribal teachers is isolation, and so that's where I've seen the very best from WestEd! As a result of bringing people together, it's helped people to realize that everybody has the same problems, and to start working together and talking together.
> *—Math and Science Administrator/Project Director, BIA School, Arizona*

INDICATOR 2.1: Volume of dissemination. *The total number of Consortia contacts with clients by print and/or "hits" on electronic sites will increase by 10% annually.*

In FY00, on WERC websites, a total of 200,156 web user sessions were tabulated—a monthly average of 16,680 per month. Calculated into this total are the following statistics: 23,590 user sessions on the WERC website; 22,563 for Science Adventures; 4,085 on Learning from

Assessment; and 149,918 on EdGateway. A comparison of the monthly average between FY00 and the previous reporting period, in which WERC websites experienced an average of 9,370 user sessions per month, reveals a **78%** increase in web dissemination.

INDICATOR 2.2: Quality. *A majority of the recipients of information and materials disseminated by the Consortia will report that they are of high quality and reflect exemplary or promising practices.*

The 1999 survey asked clients to rate the quality of the WERC-disseminated products they used in terms of three characteristics: being up-to-date, easy to access, and adding value to the recipients' work. Possible responses included "excellent," "good," "fair," and "poor." Of the 37 clients who provided ratings along each dimension, the majority rated the product(s) as being "good" or "excellent" with respect to the listed characteristics. More specifically, 30 clients (**81%** of those responding) reported that the product(s) were "good" or "excellent" with regards to being up-to-date, easy to access, and adding value to their work. On each measure, moreover, a majority of clients (51% to 62%, depending on the measure) rated the products as "excellent."

In the following quotations excerpted from Fall 2000 interviews, clients discuss the quality of some of the products disseminated by WERC:

> At one of the [WERC-facilitated] workshops we were introduced to a lot of great web sites, such as the Eisenhower Clearinghouse, and others that we can access from our classroom...and those are being really well received. I think that's going to impact a lot as we all get hooked onto the internet in our classrooms, so being able to access all of that information is going to be very profitable for us.
> *—HS Science Teacher, Public School District, Nevada*

> ...one of the documents that teachers have been most impressed with is a document that Art Sussman had given, called 'Awesome Ideas in Science,' which are basically big concepts and themes, and he drew on the frameworks from a number of different states to synthesize that document.
> *—Science Coordinator, Utah State Department of Education*

Earlier sections in this report include additional comments that speak to the quality of materials disseminated by WERC.

INDICATOR 2.3: Utility. *A majority of the recipients of information and materials disseminated by the Consortia will report that they have contributed to improving their work.*

This indicator was met. Fifty-three survey respondents indicated that they received dissemination materials from WERC. The materials listed included products such as *ENC Focus, Ideas That Work, Teacher Change: Improving K-12 Mathematics,* the WERC website, the Science

Adventures website, *Tales from the Electronic Frontier,* and *Learning from Assessment*. These 53 clients were then asked a series of questions to determine whether they had used the products(s), and if so, the extent to which they contributed to the participants' work. Thirty of the 53 clients, or 57%, reported having used one or more of the products. In turn, all 30 of these clients reported that the dissemination products they used contributed to their work, overall. These 30 represent the majority, or **57%**, of the recipients of materials disseminated by WERC who were polled by this survey. In addition, for each dissemination product listed, the proportion of clients who received the product and found it contributed "moderately" or "significantly" to their work ranged from 50% to 100%.

In addition to comments shown earlier in this report, the following quote gleaned from a Fall 2000 interview highlights the usefulness of WERC-related products:

> The publications that come out from WestEd are valuable. They come to me and I pass them out to teachers who might be needing various things. They send me a catalog of what's available through WestEd, they also send me booklets once in a while, and the Eisenhower National Clearinghouse stuff, math and science, is valuable, it lets me know where I can go to get things or what other people are doing, or where the departments are that we can connect into. So I find that very useful. I think that it's been a good resource for [teachers], like it has been for me. They use it primarily in the same way I would...[The materials] help me to be knowledgeable about what's going on in other states and what is 'best practices' there, and those types of things. It helps me to do my job better. Anything that I can draw upon, that I can pass on to my teachers, helps this job be better. That's my whole purpose, to be of service to my teachers, and so the more that I know and understand and know where to get things, or how to do it, then I can pass that to them, and then consequently it affects our students.
> *—Science Coordinator, Public School District, Utah*

A Final Word

While meeting the OERI performance indicators, WERC has provided distinct services that clients perceive as uniquely valuable. Some of these services, moreover, are difficult to find elsewhere. Many of the client interviews highlighted WERC's role in building teacher leadership and local capacity to carry out systemic reform. We are, moreover, considered particularly qualified to work with high-needs schools. Because our services span political boundaries, we are well-poised to bring stakeholders together: many clients value our effectiveness in enhancing collaboration between states, regions, districts, and schools, and this ultimately coordinates services and leverages resources and efforts for systemic reform.

Time and time again, the interviewed clients commented on WERC's reliability and the professionalism of our staff. The following quote is just one example:

> I think they've addressed needs that other organizations wouldn't have addressed without consuming much of our own resources to accomplish, and I don't think other organizations would have been consistently there way WestEd has been. Reliability is important in the world, especially when my district-level people change over time, and someday I may leave here, and WestEd's been very consistent in the delivery of resources and has been reliable.
> *—Science Coordinator, State Department of Education*

Lastly, our clients feel that we enhance local efforts by providing a valuable external perspective that is grounded in national research, and by offering the right amount of assistance at the right time:

> [WERC] supplies [our state] with direction in kind-of looking at [science reform] with a wider lens than what we typically do here. It gives us that outside review....an outside perspective [that] is extremely valuable....When we work in our own little circle, it becomes very provincial. Having individuals who are looking at curriculum and resources on a national level is extremely valuable.....It provides us with the perspective of a national resource, to make sure that we have things that are, in fact, on that scale. When we need information related to what's transpiring in other places, they're always good with that.
> *—Science Coordinator, State Department of Education*

> [WERC] addresses a multitude of needs that could not be addressed if they were not in existence. You could not expect an individual state, necessarily, to do it, unless you want to pour a lot of money into us, and then you're going to get a lot of replication. Being that resource that I can call up, and say, "I think we're at a point in time where this is important," and bounce that idea back, to clarify my thinking and make sure I'm on the right track, and then to get insight on where to get that thing I need...to go the next step. Systemic reform is systemic in a lot of ways, but it's also incremental in a lot of ways, and you've got to put one foot in front of the other. Sometimes one might give people too much information, or too much information at one time, or information at the wrong time, then set yourself back, rather than guarantee progress. WERC has provided me with resource specialists, knowledgeable people, who are privy to some information in greater depth than I am, and they can provide the right amount of info to me at the right time.
> *—Math Coordinator, State Department of Education*

APPENDICES

A: *Learning from Assessment**

B: **WERC Regional Conference 2000**

C: ***A Guide to Selecting and Purchasing Science Instructional Materials****

D: ***Dilemmas in Professional Development: A case-based approach to improving practice****

E: **1999 Client Survey with Closed-Ended Response Frequencies and Listing of Open-Ended Responses**

* indicates that this appendix is bound separately

END

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